THE

ELECTRICAL REVIEW.

VOL. LIX. OCTOBER 19, 1906. No. 1,508.

ELECTRICAL REVIEW.

Vol. LIX.] CONTENTS: October 19, 1906. [No. 1,508.

	Page
The Copper Outlook	601
Supply Company *v.* Consumer	603
Electrolysis of Underground Pipes	604
Sheffield Electrical Exhibition	604
Legal	605
Our Legal Query Column	606
Correspondence:—	
The Pentane Standard	607
Cost of Suction Gas Power	607
Patents and Prejudice	608
Depreciation and Income-Tax	608
Application of Magnetic Brakes	608
Rail Corrugation	609
Tramway Costs per Car-Mile Run	609
Electric Pumping at Collieries	609
Business Notes	610
New Fittings and Accessories for Electric Lighting and Heating (*illus.*)	617
City Notes	643
Market Quotations	644
Stocks and Shares	644
Share List of Electrical Companies	645
Electric Lighting by Wind Power	647
Some Practical Notes on the Commercial Development of Electricity Supply Undertakings	650
Gas	651
New Patents Applied For	652
Published Specifications	652

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone No. 933 Holborn; 4425 Central.

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co.

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades

AND HAS

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—In Great Britain, Post Free, per Year, 19s. 6d. To all other countries, per Year, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

READING CASES, to hold from One to Twenty-six Numbers until the volume is complete for Binding, can be had from the Publishers, Price 6s., or Free by Post (in Great Britain), 6s. 6d.

FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. Paris: VEUVE J. BOYVEAU, 23, Rue de la Banque. Berlin: ASHER & Co., 13, Unter den Linden.

Cheques and Postal Orders (on Chief Office, London), to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE COPPER OUTLOOK.

IT is extremely difficult at the present time to form a just estimate of the extent of outside influence at work on the copper market. At first sight, the renewed rise in price would appear to be the legitimate result of excess of demand over supply; and, taking this as the main factor, it would be evident that the price must not only be maintained, but must continue to increase. The demands of the electrical industry, to say nothing of the locomotive and shipbuilding trades and others affected, must ultimately be satisfied; and, although the present stimulus will lead to greater effort being made to separate out the last particle of metal, it must be some little time before it will have the beneficial effect of reopening old workings and instituting new ones. A feeling exists that there is a certain amount of artificial activity in the American market, promoted with a view to making the most of a boom. If this is the case, a reaction is bound to take place when the induced operator has had enough of close margins; but only an event of world-wide importance—a market frightened by severe political complication, or by the discovery of a substitute for copper as a conductor (it does not seem possible that an effective substitute will appear)—could convert a stale market into a badly falling one. On the other hand, a settlement of one of the outstanding problems, cheap money, or the like might, at any time, introduce a wave of activity with which copper would rise still higher. That is to say that, while we are at present some £14 from the record price of 1872, with occasional spurts to within £11, observers of American finance consider that a fall to something like £85 is not impossible. A consideration of some former booms may not be unprofitable, to see if anything may be gleaned from them as to the influences affecting the market as a whole.

As far as production goes, the increase appears to be steady from 1885, which may be called the commencing year of large outputs, to the present time. The production was then some 180,000 tons. In 1896 we find it at 373,000 tons; in 1903, 574,700 tons, and in 1905, 708,800 tons. In spite of the steady increase in output, and the growing demand which caused it, the price has been subject to severe fluctuations. It is evident that, in 1872, the small production had fallen behind the world's requirements, and the market was also probably influenced by the conclusion of a great European war, and by Stock Exchange operations as well. We can hardly otherwise account for the downward tendency which, in 1886, brought the metal down as low as £38 2s. 6d., with £43 7s. 6d. as the highest price for the year. In 1888 we again have copper at £100 10s., and see once more the influence of large holdings on an active demand. The year 1894 saw another slump, this time to £37 17s. 6d., the lowest price recorded. In 1896 the metal only recovered to £50 3s. 9d., and although in 1899 we find it at £79 5s., it experienced another drop to £45 10s. in 1902. The influence of this we observe in the production, which only increased 30,000 tons in 1902-3, whereas each year since has shown an advance of some 70,000 tons over the preceding one.

During last year the prevailing price for the first six months was moderate, £64 to £68, varying slightly with the speculators, but strong generally. From June the decisive turn of affairs in the Far East, and the relief of tension in every direction set the markets going, and after a dip to £68 15s. in September, caused probably by the withdrawal of consumers from the market and the prospect of large supplies, it continued to rise till, by the end of the

year, £80 had been reached. During the present year, the tendency was all in an upward direction until the middle of June. The continued delay of buyers to come in, and forced realisations together with increased supplies then brought the price down until it reached £78, after which fresh speculation and the requirements of the market have forced it to the present unusual figure. The visible supplies just now stand at 12,480 tons, so that no very great fall can be expected on that count. It would appear that, in the absence of very powerful operations, a natural minimum of £80 has been marked for some time to come. Whether the Caucasus mine will have any marked influence on European prices, should it start early next year, remains to be seen. It is probable that the high prices will have an effect on output, wherever possible. Taking this into consideration it would seem that we may shortly expect easier markets, to be once again followed by high prices as the tendency to take advantage of the lower price becomes evident.

Commercial Development of Electric Supply.

We find that the articles we have published from time to time on the necessity for the more energetic development of the commercial side of the electricity supply business have aroused considerable interest, and a keen desire is being expressed by many engineers and managers of electrical supply undertakings for more definite information (based on real practical experience) that would assist them to establish a special department for securing new business. With this in view we have arranged for the series of articles entitled "Some Practical Notes on the Commercial Development of Electric Supply Undertakings," of which the first appears in the current issue. These articles are written by a gentleman who has not only had exceptional opportunities for the study of methods of commercial development in the United States, but has, furthermore, carried out many of these methods with remarkable success in connection with the Electric Light and Power Co., of which he had superintendence as electrical engineer. We trust that Mr. Matthews's articles will be appreciated by our readers, and that many useful hints will be derived from them by those who are interested in this department of commercial activity.

Islington.

The flourish of trumpets with which the *Daily News* heralds the prosperity of the municipal electric undertaking in "Merrie Islington" is a little "previous," for an impartial examination of the figures will show that there is no profit at all.

Let us deal first with the Public Street Lighting, which has already been a source of large profits to the electricity undertaking, but at the expense of the ratepayers at large.

In the first year of the supply, 200 arc lamps were charged for at some £40 per annum, the contract price in the City of London being £26; thus an excess of about £2,800 helped to swell the revenue from street lighting beyond the legitimate market price at which a company would have undertaken it.

Credit is now claimed for a reduction in the cost of the street lighting from 4d. to 3d. per unit, but either of these figures represents an enormous and illegitimate profit.

According to the accounts of the Corporation for last year, when the public lighting cost 3·50d. per unit, the total cost per unit sold was 2·21d., leaving a margin of 1·29d., and with the reduction now made to 3d., there should still be a large profit. Thus the electric lighting accounts are improved by simply taking money out of one pocket of the ratepayers to put it into the other.

But it is asserted that whereas there was a loss of £1,740 upon the electric undertaking in 1903, there has been a profit of £14,657 on the succeeding three years.

Let us analyse the figures of the accounts for the year ending March, 1905, when a profit was claimed of £4,547.

The total capital expenditure was £410,229, and the amount provided for sinking fund was £6,356, or 1·58 per cent. Nothing whatever was set aside for depreciation, and of course it cannot be contended that it was provided for in the amount devoted to repayment of capital.

If the depreciation be taken at 4 per cent., the sum to be set aside would be £16,409, or more than three and a half times the alleged profit.

So far as the cost of public lighting is concerned, Islington charges more than any other metropolitan local authority. The following table shows the relative total cost per unit sold and the price charged:—

	Total cost per unit sold.	Price charged for public lighting.
Battersea	1·44d.	2·38d.
Bermondsey	1·05d.	2·21d.
Fulham	1·33d.	1·54d.
Hackney...	0·88d.	1·64d.
Hammersmith	1·09d.	1·22d.
Hampstead	1·84d.	2·59d.
Islington	**2·21d.**	**3·50d.**
Poplar	1·25d.	1·50d.
Shoreditch	1·53d.	2·35d.
Southwark	1·81d.	2·23d.
Stepney	1·01d.	1·38d.
St. Pancras	1·36d.	1·50d.

It is interesting to compare the above figures with the cost of public lighting in those metropolitan districts which are supplied by private companies—in eight cases they do not supply any public lighting, but in the remainder the cost and terms are as follows:—

	Total cost per unit sold.	Price charged for public lighting.
Charing Cross	1·57d.	2·90d.
City of London	1·22d.	2·30d.
Kensington	2·27d.	2·50d.
Notting Hill	2·05d.	2 50d.
St. James'	1·84d.	2·37d.
Westminster	1·75d.	2·02d.

It will be seen that Islington charges, even under the proposed reduced price, more for public lighting than the other local authorities or any company supplying in the metropolis.

That the Islington municipal trading in electricity is or ever has been a commercial success, cannot be substantiated by the accounts, and there is no warrant now for the claim of profits due to more businesslike administration. The losses may be less, but there are no profits yet, and, so far as the ratepayers are concerned, they would have been much better off if they had never embarked in a business they did not understand, and upon borrowed capital.

Labour Statistics of Continental Electrical Industries.

In view of the extent of the electrical industries on the Continent, it is somewhat surprising that the recently-issued "Third Abstract of Foreign Labour Statistics," published by the Board of Trade, does not give fuller information on the subject than is actually afforded. Consulting the index we find that the wages earned and hours worked are stated in the cases of Belgium and Hungary only.

In Belgium the number of artisans (male) engaged in the manufacture of electrical machinery were 1,179, of whom 39 earned under 2 fr. per diem; 288 earned 2 fr. and under 3 fr.; 427 earned 3 fr. and under 4 fr.; 295 earned 4 fr. and under 5 fr.; 108 earned 5 fr. and under 6 fr.; while only 22 earned 6 fr. or over. The average hours of labour, excluding intervals and overtime, were:—Over 9 and up to 10 hours, 907 employés; over 10 and up to 10½ hours, 105 employés; and over 10½ up to 11 hours, 263 employés.

In Hungary, "electricians, makers of electrical apparatus, and workers in generating stations," numbered 2,402. Returns were made as to the earnings of 2,026 of these, of whom 152 earned 8s. 4d. or less per week, 517 earned over 8s. 4d., but less than 11s. 8d.; 942 earned over 11s. 8d. and up to 16s. 8d.; 335 earned over 16s. 8d. and up to 25s.; while 80 bloated plutocrats received 25s. or over. The hours of labour for 281 workpeople were nine or less; for 1,351 workpeople over nine and up to ten; for 97 workpeople over 10 and up to 11; for 229 workpeople over 11 up to 12; while 35 worked normally over 12 hours per day.

Certain British manufacturers would sigh with unaccustomed content if either their own employés realised the hours worked and wages earned by their industrial rivals, or if energetic trade union leaders would talk of the necessity of levelling up hours and wages in these countries in place of seeking to manufacture grievances at home.

Electric Lighting under Municipal Restrictions at Berlin.

The disadvantages to supply works, installation contractors and consumers of the operation of a practical monopoly under peculiar municipal restrictions have just been suddenly brought forcibly home in Berlin in respect of the concession held by the Berlin Electricity Works Co. It appears that the company issued a circular to the local contractors on September 20th intimating that as the generating plant would shortly reach the maximum permissible output, and as applications for connections had become very numerous, it would be impossible from that time to give consideration to any fresh inquiries, either for new services or extensions of existing supplies. At the same time, the company announced that negotiations had been opened with the "magistrate" of Berlin with a view to further extension of the company's works, and that notice would be given as soon as the connection of installations could be resumed. The intimation fell like a thunderbolt upon Berlin, and it at once resulted in the holding of meetings of the district branch of the syndicate of installation contractors of Germany and of makers of electrical plant, materials and accessories, as their interests are seriously endangered by the stoppage in the supply to new consumers and in cases where extensions of existing installations have been in progress or have still to be commenced. The first thing done was to appoint a deputation to wait upon Herr Kirschner, the mayor, but the representations made on September 27th proved of no avail. The Mayor, in reply, stated that the supply company declared that it had reached the prescribed maximum limit of its capacity, and it was not under any obligation to do more, and he was unable to intervene. It was obvious that the company had not any competition to fear now, and it, therefore, sought to obtain a prolongation of its concession from 30 to 50 years. During the discussion it was suggested that the company was acting illegally, that the proposed new agreement should allow of the introduction of a competitive supply, and that in the meantime the magistrate, instead of placing difficulties in the way, should grant facilities for the establishment of block stations or large installations having generating plant for the supply of blocks of buildings. It appears that the legal basis of the relations existing between the Berlin Electricity Works Co. and the Municipal Council is founded upon the "new agreement" of August 25th, 1888, and a supplementary agreement of May, 1890. The first clause of the latter expressly stipulates that further central stations than those in the Markgrafen Strasse, Mauer Strasse, Friedrich Strasse, Spandauer Strasse, and the Schiffbauerdamm shall not be allowed to be erected. The combined output of these stations is limited to 42,500 KW., and this capacity has already been attained, and cannot be exceeded owing to the operation of the terms of the agreement. Immediately on its becoming known that the maximum demand was reached the company again approached the magistrate for permission to install additional plant, and negotiations on the subject are already in progress. The company has been reproached for furnishing electrical energy to the suburbs, but this is expressly allowed by the supplementary agreement. When the maximum output of the various stations was fixed there was no question of supplying the tramways, although these are now entirely worked with power delivered by the company. The directors, it seems, informed the magistrate early this year of the fact that the load on the generating plant would soon be at its maximum, but no notice was taken, or the matter was not considered of importance at the time, and the present dilemma has consequently arisen owing to the neglect throughout the summer. The company does not possess an authorised monopoly, as it has not an exclusive right to lay cables in the streets, although the absence of competition has conferred upon it virtually a monopoly. In 1915 the magistrate has the right, under the existing agreements, to take over the company's plant at the book value or at a valuation, and the city already has the right to establish municipal supply works. It is, therefore, open to the city either to erect works or to acquire those of the company in 1915. The company now seeks authority to install additional plant of a total of 37,000 KW., and suggestions are made that if permission is granted to carry out the work the plant shall become purchaseable simultaneously with the existing machinery in 1915. In the meantime, the position of contractors is far from enviable, as many of them have proceeded with installations which now have no early prospect of being connected with the distributing mains, while other works of a similar character are or have been in progress.

SUPPLY COMPANY v. CONSUMER.

[BY OUR LEGAL CONTRIBUTOR.]

The case of Mappin & Webb *v.* St. Marylebone Borough Council, a report of which appears elsewhere in this issue, raises a novel and interesting question with regard to the relationship of supply authorities and consumers. The facts may be very briefly stated. The St. Marylebone Borough Council was originally entitled to supply electricity at 100 volts. Finding that supply at this pressure was not economical, it altered its system to one which gave consumers 240 volts. The bulk of the consumers fell in with this arrangement; but Messrs. Mappin & Webb, being advised that the change would involve a serious increase in the price of their electrical energy in the course of the year, refused to consent to the change, although the Council offered to bear the expense. Thereupon the Council obtained the leave of the Board of Trade to dispense with the consent. Messrs. Mappin & Webb, however, still refused to allow the change to be made, and declined to permit the officials of the Council to enter their premises with a view to carrying out the necessary alterations. Unwilling to cause trouble, the Council appears to have consented to continue the supply at 100 volts. As our readers are probably aware, if the pressure of supply is not properly maintained, a consumer may summon the "undertakers," who may be mulcted in penalties. Messrs. Mappin & Webb, finding that the pressure was so badly maintained as seriously to interfere with the lighting of their premises, eventually summoned the Council, upon which a Metropolitan police magistrate has now inflicted a fine.

The points which arise in this case are so numerous that it is difficult to deal with them all in the compass of a short article; but the salient points may be touched upon. First and foremost occurs the question—What are the rights and duties of undertakers who have taken the very serious step of altering the pressure at which they supply electricity?

The Board of Trade regulations provide that the standard pressure shall be fixed by the undertakers, and notice of the amount of such standard pressure must be given to the local authority before the undertakers commence to supply energy to consumers, and must not be altered except under certain conditions. According to certain new regulations which were made in 1901, an alteration cannot, in general, be effected without the consent of the consumer, but if the consumer withholds his consent, steps may be taken to dispense therewith. Thus, where a consumer refuses, after the undertakers have offered to comply with the general terms and conditions imposed by the local authority and, if not

required to do so under those terms and conditions, also to pay the reasonable cost of, or incidental to, the change (including compensation for any loss or damage incurred in consequence of the change), the undertakers may appeal to the Board of Trade, which may give consent on behalf of the consumer. What, then, is the position of the consumer who has the consent given for him? If the undertakers are so minded, it is clear that they may refuse to supply him with electricity altogether, unless he chooses to take it at the new pressure, for the only obligation imposed upon undertakers is to supply electricity to every consumer on the same terms on which any other company or person in such part of the area is entitled under similar circumstances to a corresponding supply (Electric Lighting Act, 1882, Sec. 19). Now it is clear that the position of the consumer who does not fall into line with the rest is the same as that of the other consumers once his consent has been given for him by the Board of Trade. It follows, therefore, that if he does not see his way to take a supply at the new pressure he cannot demand a supply at the old.

But assume that, as in the case under review, the undertakers for the sake of peace or for some other reason continue the supply at the low pressure. Can they be summoned, or are they to be held liable to penalties if they fail to maintain that pressure? Let us see what the Act says upon the subject of penalties: "Whenever the undertakers make default in supplying energy to any owner or occupier of premises *to whom they may be and are required to supply energy under the special order*, they shall be liable in respect of each default to a penalty not exceeding 40s. for each day on which the default occurs." (See Electric Lighting (Clauses) Act, 1899, Sec. 30 (1)).

Penal enactments are always strictly construed, and it seems to be obvious that a consumer who refuses to fall into line, but to whom the undertakers make a concession, is not a person "to whom they are required to supply energy" in accordance with the above provision. So far as he is concerned, they are under no statutory obligation; and no magistrate can have power to impose a penalty in respect of what is a mere breach of contract.

With all deference, then, to the learned magistrate, we venture to differ from the opinion which he has expressed. If the Borough Council enters into a contract to supply electricity to a consumer at 100 volts, and fails to do so, the consumer may pursue his remedy in a civil court, provided, of course, that it is not *ultra vires* of the Council to make such a contract. As to this latter question we express no opinion at present.

ELECTROLYSIS OF UNDERGROUND PIPES.

Although, thanks to the Board of Trade rules, damage to underground pipes through electrolysis has been kept within bounds in this country, the subject is receiving much attention in the larger towns of Germany and America, where less stringent rules exist. The result is the gradual accumulation of a mass of useful information as to the causes of the trouble. A paper by Putnam A. Bates in the *Railway Gazette* deals with the American side of the question, and is based on some experiments carried out by the author in a suburb of New York.

He finds that no general rules can be laid down, because the local and climatic conditions greatly affect the matter, and tests carried out at one time of the year may contradict those made at another. Each particular case must, therefore, be systematically studied before useful protective steps can be taken.

In such an investigation the important point is the determination of the amount of current leaving the pipes, and whether this current leaves at a restricted area or leaves at a low density over a large area. This current measurement is, however, a difficult one to make, and most investigators have confined themselves to measurements of potential difference between the pipes and the rails. Although the potential difference is a rough guide as to electrolytic action, it cannot safely be considered as a measure of this action, for it is only one of the factors determining it—others being the resistance and chemical condition of the surrounding earth.

The author mentions a case in which a P.D. of 12 volts existed at one end of a length of water pipe which was free from electrolytic action, and only 3 volts at the other, although considerable electrolytic action existed there. The explanation in this case was the fact that the pipe lay on the slope, and the high-volt end was on a hill composed of dry sandy loam, whilst the other end lay lower in damp soil. A heavy current flowed along the pipe, causing a drop of 9 volts, and leaving the pipe at the lower end with considerable electrolytic action.

In the course of this particular investigation numerous voltage measurements were made with a 0 to 15-volt Weston instrument having a resistance of 1,357 ohms. The measurements were made at various times during the day, and showed voltage differences between pipes and rails varying from a minimum of 3 up to a maximum of 11 volts. It was also found possible to measure the actual current flowing in two particular loops of piping, and in each loop the current strength was sufficient to have caused rapid deterioration if it had left the pipes over a restricted area. Of course the presence of a large current in a given piece of pipe does not necessarily mean that the pipe will be damaged, for the current may travel along a well-jointed line of piping for hundreds of feet before leaving the pipe, and causing damage. The flow of current from the pipe to the earth may be encouraged at a particular point either by the lower resistance offered by some portions of the pipe surface, or by a small leakage of water occurring and so forming a low resistance path into the earth. Sub-surface streams crossing the pipe would have the same effect. Another common cause is the presence of a very bad joint, offering more resistance to the flow of the current than the surrounding earth offers, in which case the current will leave the pipe at this joint and re-enter it further on. Even when a pipe system appears to be negative to the trolley rails practically everywhere, a dangerous condition often exists, for the current may be leaving the pipe at a point not easily tested from the surface, to re-enter further on, and make the next hydrant or exposed joint negative to the rails.

An interesting point brought out by the tests was the rapid destruction of the wrought-iron and lead house connection water-pipes, as compared with the cast-iron water mains. This difference the writer puts down to the thin coating of molten sand which forms on cast-iron piping during manufacture, and serves as a partial insulating protection. The wrought-iron and lead pipes have no such protection, and form a preferable path for the current at points where it tends to leave the pipes. The comparatively small thickness of metal in these pipes helps to make them the chief source of trouble.

In conclusion, the writer deals with the available preventive measures. A careful investigation will often suggest methods of reducing the trouble to a minimum. For instance, in this particular case it was found that a number of lead pipes were badly corroded through the current in one main leaving by these pipes, passing through 50 ft. of earth, and returning by another main. If the two mains had been metallically connected this damage could have been prevented. By careful bonding or welding of the rail joints the chance of leakage is greatly reduced. Any very defective joints can sometimes be detected by taking a trip over the line after a slight snowfall; the heat generated at the bad joints will melt the snow on them.

If the danger zone is confined to a particular district, an improvement can be effected by running a return feeder from the pipes in this district back to the negative bus-bar.

The writer considers, however, that the only real preventive is the use of an insulated return, in the form either of the double-trolley system or of the conduit system.

SHEFFIELD ELECTRICAL EXHIBITION.

Sheffield's first Electrical Exhibition was opened by the Lord Mayor (Col. Hughes, C.M.G.) in the Corn Exchange Building on September 27th, and will close to-morrow, October 20th.

The Electric Supply Department has been in the hands of the Municipality since the year 1898, when it was purchased from the pioneer company, together with a Wiring and Installation Department, which has since developed into the principal electrical contracting concern of the City.

A progressive policy of advertising and canvassing on the part of the general manager, Mr. S. E. Fedden, has resulted in a rapid growth of the load for all purposes in the face of keen competition from the gas company, whose rate for lighting is 1s. 5d. per 1,000 cb. ft., and for power 1s. 5d. down to 1s. 2d.

Years of prosperity and a great reputation have not been without a certain disadvantage in confirming the local manufacturers in that conservatism of method which so often characterises the best English work, and to many of the steel and cutlery makers the latest advances in electrical work are but little known. An effort has been made to include in this Exhibition the very latest novelties in the applications of electricity to manufactures, while representing fully the great advances which inventors and designers have achieved in the lighter appliances for lighting, heating and the many uses to which electrical energy can be put in the house.

Electricity for heating at 1d. per unit is shown to be a paying proposition at the stall and electric kitchen of Messrs. Isenthal and Co., who cook the food for the Exhibition Café in view of the public, and also display a fine assortment of utensils and tools on the "Electra" system.

The British Thomson-Houston Co. and the British Prometheus Co. also have a quantity of apparatus on view, and a local laundry has an attractive stall, where a lady irons linen with electrically-heated flat-irons of various makes and types.

A heating furnace for hardening tools and annealing metals is shown by the Electrical Co., Ltd., of London. In this application a mass of barium chloride is rendered molten by the passage

of the current between two immersed iron electrodes, which are connected to the secondary of a variable transformer. The temperature of this bath can be regulated closely up to 2,417° F., and it is claimed that tools such as cutters and drills immersed in it can be uniformly heated in every part and hardened with better results and less risk than by gas or fire.

In conjunction with this exhibit the pyrometers of Messrs. Siemens Bros., and the Cambridge Scientific Instrument Co. have proved of use and interest, and the local steel makers are daily visiting the Exhibition in order to harden their various steels and experiment with the furnace, which has attracted much attention.

The Kjellin induction furnace can be seen in operation in the form of a 10-kw. model which has been made for research work. With this apparatus experiments are carried out daily, and the Grondel Kjellin Co. show fine samples of steels and briquettes made by this process in Sweden.

Welding by electricity is in the hands of Mr. T. Scott Anderson, of Sheffield, who displays a rod machine by the Electric Welding Co., and many examples of heavy welding for engineering work.

The radiant stoves which have come so much into favour since the general reduction in price of energy for heating are well represented. Several dozen are shown in operation, from the simplest pattern to costly and beautiful productions in marble and gilt metal.

The Dowsing Co., through a local agent, show the application of radiant heat to medical purposes by means of their "home Turkish bath cabinet" and an elaborate appliance in the form of an asbestos bed, in which the patient can be surrounded with heater lamps controlled by a rheostat, and subjected to a wide range of temperature.

Appliances for ventilating and air purifying are well represented. Messrs. Ibbotson Bros. & Co., Ltd., of Sheffield, show Talbot's patent air washer. In this machine the air is drawn from any source—in this case a particularly grimy thoroughfare—by a fan, the periphery of which is covered with wire gauze. A small stream of water directed on to the vanes of the fan is broken up into spray and forced through the gauze in company with the air, which it subjects to a scrubbing action, resulting in the grit and solid impurities being carried away with the waste water. The cleansed air is distributed throughout a building by a system of pipes, and can be warmed in winter to any degree by a heater placed in the main air trunk. This machine deals with 5,000 cb. ft. of air per minute.

An analysis of the black deposit found in the waste water from a purifier in use in a large steel works yielded earthy matter, 40 per cent.; carbonaceous matter, 30 per cent.; silica, 23 per cent.; and iron, 7 per cent. The water was also found to have absorbed sulphur dioxide and carbonic acid gas.

This firm also exhibit a self-contained cabinet purifier for use in a single room or small suite of offices. In this apparatus, which runs quite silently, and resembles a bookcase, a small motor-driven fan is combined with an electric heater and water tank, making the plant quite simple and independent of the building.

An ingenious form of air circulator is shown by Mr. T. Scott Anderson for the Stellite Electric Manufacturing Co. A small fan of the usual type is enclosed in an iron casing containing water which it churns up with the air, removing to a great extent the suspended impurities and making it possible to charge the delivered air with perfume or disinfectant.

On the same stall several types of ozonisers attract attention and help to support the claim of the promoters that the Exhibition is the brightest and healthiest spot in the city.

Fans and pressure blowers for ventilating, removing dust, hardening the new steels and working forge fires are shown by the James Keith & Blackman Co., and the Sturtevant Engineering Co.

Amongst the numerous exhibits of interest to medical men must be mentioned the Tudsbery Influence Machine for X-ray work. The machine is enclosed in an air-tight case in which the pressure can be raised by means of an ordinary cycle pump to 50 lb. per sq. in. A calcium chloride dessicator is provided, and the result is to enable a spark 4½ in. long to be obtained from a machine of comparatively small dimensions and low cost. With this apparatus radiographs of the hand can be taken in 15 seconds, the results being quite equal to those obtained with the usual induction coil and batteries. The exhibitor, Mr. E. A. Brook, of Sheffield, has an interesting display of high frequency apparatus for medical use and general photographic and kindred appliances.

Recent progress in electric illumination is well represented, the general lighting of the Hall inside being carried out with flame arc lamps of several makes, including a magazine lamp by Messrs. Oliver & Co., who now claim to have produced a satisfactory long-burning flame lamp for use on alternating-current circuits. Examples of the tantalum, osmium and mercury vapour lamps of the Bastian and Cooper-Hewitt patterns excite considerable interest in comparison with the established carbon-filament glow lamps exhibited by the Edison & Swan United Electric Light Co., the Sunbeam Lamp Co., and the Robertson Electric Lamps, Ltd., the latter having their attractive glass-blowing display in operation. The variety of forms and sizes in which incandescent lamps are made to-day, and the perfection of detail which enables them to be sold at their present price, suggest that the advent of a really satisfactory material for a high-efficiency filament should be rapidly followed by a commercially successful lamp, if taken in hand by those who have matured so much labour and experience in the carbon lamp of to-day.

The use of electricity for machine driving is shown in a variety of forms by the Corporation Electric Supply Department, which has a complete engineers' workshop in operation with the usual tools driven by two-phase motors through a variety of gearing.

Electrically-driven hoists, sand rammers, pumps, and polishing machinery, a Reavell compressor operating pneumatic foundry tools, and motors in connection with the different exhibits of moving machinery bring home to the lay mind the many advantages of electric driving in the most forceful way.

The supply to the Exhibition, the maximum demand of which is about 150 kw., is two-phase at 2,000 volts transformed to 200 volts on a stall which is equipped as a model bulk supply sub-station for a large works.

The transformers are of 100 kw. capacity, and were made under the Burnand patents. This type has been in use for some years in Sheffield with good results, and experiments now being made with a new and improved iron make it probable that a great reduction in the size and capital cost per kilowatt will be effected.

A good display of cable sections and street boxes by Messrs. W. T. Glover & Co., and standard fittings in use on the Sheffield mains, call for notice.

The manufacture of electrical machinery in Sheffield is increasing yearly, and Messrs. Vickers, Sons & Maxim have lent some fine examples of their direct and alternating-current standard motors, the most noticeable being a 300-kw. synchronous motor-generator, being one of a set of four intended for the power supply of their River Don works. It is for converting alternating current at 650 volts 50 periods to direct current at 220 volts, and will be driven from three-phase turbo-alternators now being constructed by Messrs. Vickers in their works.

The firm of W. E. Burnand & Co., of Sheffield, have a display of small single and two-phase motors driving polishing and other light machinery. They also make a feature of their auto-starters and controllers for motors, which allow of working with varying voltage according to the load upon the motor, so making for higher efficiency and improved power factor.

Modern switchgear is represented by Messrs. Steel, Peech and Tozer, Ltd., of Rotherham, and the Switchgear Co., Ltd. (late J. G. Statter), of Birmingham. The former firm has a good display of Boyne's patent liquid motor starters for direct current machinery, and the Birmingham house is showing high tension switch panels suitable for large motor installations; also their free handle circuit-breakers fitted with Statter's patent time lag. They claim that by using this in conjunction with motors it is possible to work nearer to the full capacity of the motor on a fluctuating load, with resultant economy in the first cost of the installation. The time lag device consists of a sucker which adheres by surface tension to the bottom of a box containing glycerine. A little pull is sufficient to separate the adhering surface if applied for a sufficiently long time, a heavy pull will separate them instantly. In addition to the advantage of the time lag device, a heavier hammer blow is secured for releasing the cut-out, as the solenoid has to exert a force greater than that required to merely raise the weight of the core. The firm has a fine display of spanners of all kinds insulated with moulded ebonite, which appeal particularly to the practical man in charge of electrical plant.

The Tudor Accumulator Co. show examples of their well-known accumulators and the "Trumpy" automatic regulator switch in operation.

An attempt has been made by Mr. Fedden to bring together various examples of modern turbine practice. Messrs. C. A. Parsons & Co. have a number of beautifully finished models of their machines coupled to electric generators and air compressors. A 5-h.p. De Laval machine by Messrs. Greenwood & Batley, of Leeds, and a full size impulse turbine by the Electrical Co., Ltd., with open casing, enabling the blades and nozzles to be seen, form interesting features of the display. In addition there are pictures of the Zoelly machine, and a good stand of photographs of work carried out by the Westinghouse Co. in different parts of the world.

At the time of writing the Exhibition has been extremely well patronised, some 25,000 persons having paid for admission, and it seems certain that the labours of the general manager and his staff will be amply rewarded by an increased demand for electricity throughout the City.

LEGAL.

Crompton & Co., Ltd., *v.* Nicholson & Co.

In this case, which was heard by the Assistant Judge at the Mayor's Court, on October 12th, the plaintiffs (Messrs. Crompton & Co., Ltd.) sought to recover the sum of £16 4s. 2d. in respect of a 135-volt dynamo and certain accessories supplied by them to the defendants, electrical engineers at Manchester. The defendants sought to reduce the claim by a set-off and counterclaim alleging that the dynamo supplied had certain defects which cost them some £12 to put right.

Mr. Harold Morris appeared for the plaintiffs; Mr. W. Valentine Ball for the defendants.

It appeared that the machine in question was ordered on September 29th, 1905. It was to be delivered by the plaintiffs to Messrs. Gardner & Sons, Ltd., of Patricroft, Manchester, who had been employed by the defendants to supply, and connect with the dynamo, a petrol engine. The plant when completed was to be, and was afterwards, sent to the residence of Mr. Hawker, of Hay, in Hereford, where it was fitted up by the defendants.

Witnesses called on the part of the plaintiff said that the dynamo

was thoroughly tested before it left Messrs. Crompton's works; that, in consequence of the tests, certain alterations were made; and that, so far as they knew, it was a sound machine. While the dynamo was at Manchester it was pointed out by the defendant that it ran "anti-clockwise," whereas the engine ran in the contrary direction. It was admitted that this mistake, however, was due to no fault on the part of the plaintiffs; and in order to remedy it, the plaintiffs recommended that either the brushes should be shifted through an angle of 90°, or else the connections from the brush spindles to the terminals inside the end cover should be crossed. Some such change was effected, and the plant was tested, and was found satisfactory before it left Messrs. Gardner's works.

On the part of the defendants, Mr. Robert Jaffray Nicholson said that he erected the plant at his customer's house at Hay, in Hereford, early in December. It ran well at first, but owing to complaints, he went there at the end of the month to find that it was impossible to get the dynamo to give more than 50 volts, whereas the contract specified 135 volts. Testing the machine, he found there was earthing taking place. Without communicating with the plaintiff's works at Chelmsford, owing to the fact that the works were closed for Christmas, Witness took the dynamo to pieces himself and found that the ends of the wires connecting the shunt windings of each bobbin to its neighbour had been pushed and fixed too far through the sockets, thus causing the earth. After correcting this and re-assembling the parts, the dynamo developed its full power. In his opinion the steps taken at Messrs. Gardner's Works to alter the direction of rotation, could not possibly have caused this defect. He, however, had not seen the dynamo when delivered at Manchester. He claimed £12 0s. 6d. for effecting the repairs.

No witness was called from Messrs. Gardners.

The assistant Judge, in summing up, said the onus was on the defendant to show that when the dynamo left the plaintiff's works it was defective. A link in the chain of evidence was missing, namely, that no witness had deposed as to what Messrs. Gardner did to the machine. It was for the jury to say whether the defendant had proved his case. Assuming that there was a defect, it would be for the jury to say whether the defendant had acted reasonably in doing the work himself without communicating with the plaintiffs.

The jury found that there was no evidence that the machine was defective when it left the plaintiffs' works, and a verdict was entered for the plaintiffs on claim and counterclaim.

Tramway Claim.

At Dewsbury on the 12th inst. a case remitted from the High Court was heard, in which Edward Littlewood, a collier, sued the Yorkshire Woollen District Electric Tramway Co. for £500 for injuries caused to his four-year-old child by one of the defendants' cars, which ran over the child and cut off one of its feet, in Huddersfield Road, Dewsbury. The jury awarded £350 damages and costs, the Judge ordering that provision should be made for the child's future.

W. Haddock (Mappin & Webb, Ltd.) *v.* St. Marylebone Borough Council.

On October 10th at Marlborough Police Court, plaintiff, a director of Messrs. Mappin & Webb, Ltd., Oxford Street, sued the defendants for having on September 24th to 28th failed to maintain a supply of electricity to plaintiff company sufficient for their purposes. The failure was alleged to be a breach of the regulations of the Electric Lighting Order of 1901.

In arguing the plaintiff's case, Mr. Arthur Newton said that for months past they had constantly had to complain of the bad lighting, and there had been considerable correspondence. The undertakers under the order had to declare to the consumer the pressure they proposed to supply and maintain at the consumer's terminals. That pressure was subject to a variation of 4 per cent. above or below the pressure stated; that was to say, it might go down to 96, if the voltage was to be 100, or up to 104. If there were default, there was a penalty provided of £5 for every such default. Since the summonses mentioned, others for several dates at the beginning of October had been taken out, making 10 in all, as no improvement had then taken place. On September 24th the pressure varied from 84 to 95, instead of being the minimum required of 96. The following day, once only did they get within the proper limit, and there was a shortage on all the other days mentioned. The effect of this in a business house was that if at 100 voltage a lamp was 8 c.p., when the voltage was reduced to 96 it only gave 6 c.p., and at 85 only 2·8.

Plaintiff, in giving evidence, said that formerly companies supplied the light until the borough took over the supply. In an old agreement a voltage of 50 was mentioned, but they had never received so low a pressure, but always 100, with the exception of the shortage now complained of. The borough adopted the 240-volt pressure system, but the firm refused to give their sanction, and the borough obtained the consent over their heads from the Board of Trade.

According to the report in the *Daily Telegraph*, Mr. Plowden asked Mr. Montgomery why the borough, if they had that consent, did not install the 240-voltage system at complainant's premises or refuse to supply them at all.

Counsel explained that notwithstanding that consent they could not enter the firm's shop to carry out the alteration without the firm's approval. Not wishing to be high-handed in the matter the borough continued to supply them temporarily with a 100 voltage which, however, put the borough to unnecessary expense, because they were supplying the district generally with 240 voltage—that higher voltage being much cheaper to produce. Although all expenses incurred in making the alterations for installing the higher voltage would have to be met by the borough, the complainant's refused to have it.

Mr. Haddock said his firm refused because their electrical engineer considered that in the consumption of electrical energy at the higher voltage they would probably have to pay for it at a rate which would be 33⅓ per cent. more than they were paying for the voltage of 100. All his firm wanted was a proper light.

Mr. Rashleigh Phipps, an electrical expert, supported the opening statement, and Mr. John Radford, employed by complainants, said that owing to the bad light oil lamps and candles had to be used, and stated that the borough had recently put a new machine into the premises for the electric light, and since then the light had been better and satisfactory.

Counsel for the defence submitted that the borough had no case to answer, because the only voltage that had been declared as required by the order in an agreement with Mappin & Webb was 50, and although 100 was actually supplied instead of the 240 which ought to have been, that was a matter of arrangement between the borough and complainants, and any deficiency below the 100 did not render the borough liable to any penalty in a police-court. If the complainants had agreed to the 240 voltage they could have demanded and compelled the borough under penalty to supply the voltage, but as the 100 voltage was supplied at their own request they could not demand the 100 to be kept up.

Mr. Plowden was of opinion that defendants were to blame throughout, and must be prepared to pay the full penalty of £5 on each summons, and £10 10s. costs (£60 10s. in all). The magistrate was understood to say that in the event of the offence not being abated there would be a continuing penalty of £2 for each day.

When requested by Mr. Montgomery, Mr. Plowden said he would state a case on a point of law.

On Saturday, Mr. Bell attended before Mr. Plowden on behalf of the Council, and said that at the hearing it was stated that, if there were future defaults, there would be a continuing penalty of £2 a day. Mr. Bell contended that the magistrate had no power to impose a penalty for a prospective offence, and that that part of the decision could not, therefore, be enforced. According to the *Times* a gentleman representing Messrs. Mappin & Webb said that he was afraid that was so, in view of the case of "The Chepstow Electric Light Co. *v.* The Chepstow Gas Co.," which had been shown to him by Mr. Bell.

Mr. Plowden said that, if both sides were agreed on the point, no attempt would be made to enforce it.

Messrs. Mappin & Webb's representative asked that the whole of the penalty imposed should be handed over to the firm, subject to anything in the Act which might prevent that course being taken. Mr. Plowden acquiesced, remarking that, as they had suffered pecuniary loss, they ought to be recompensed.

[Comments are made on this case by our Legal Contributor on another page in this issue.]

OUR LEGAL QUERY COLUMN.

[Questions addressed to the Editors for insertion in this column should be written on one side of the paper. Free use of fictitious names, &c., may be made. Answers are furnished by a duly qualified lawyer.]

No. 56.—Charges for Electricity.—Motor Rates.—Motor for Gas Compressor.

"Rock" writes: "We have a case in point here of a consumer wishing to hire a motor from us for the purpose of driving a compressor in connection with a high pressure gas lighting installation. Under these circumstances, would the department be justified in charging for the current consumed at the ordinary lighting rate?

"I enclose you herewith pamphlet of our present system of charging."

*** The question is one which appears to admit of discussion. In one form or another, it has often been dealt with in this column. The broad point is—if undertakers advertise the supply of current for motors at a lower rate, are they entitled to consider the objects to which the power supplied is to devoted? A query was once addressed to the Electrical Review as to whether a consumer obtaining current at motor rates might use it in a motor-generator to supply his house with light. The view was expressed that he could not do so, inasmuch as the plan adopted would be a mere colourable method of obtaining lighting current at cheaper rates. No magistrate would impose a penalty upon undertakers who refused a supply at motor rates in circumstances of that kind. The question put by "Rock" is a variant of this, and although by no means easy, appears to turn upon a subsidiary question, namely, What knowledge or guarantee has the supply authority that if the consumer did not burn high pressure gas he would take current from them? Here, as in the former case, it is a question of fact. Given that a consumer is entitled to a supply at power rates for power purposes, it would seem that unless the undertakers can show something in the nature of fraud upon them they have no power to demand that the power shall not be used in any particular

way. At the same time, "Rock" would do well to consider the advisability of revising his rules in order to remove all doubt upon the point.

CORRESPONDENCE.

Letters received by us after **5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Pentane Standard.

Mr. Paterson, in his recent letter, very justly points out that the conditions governing the position of the centre of illumination of the Harcourt 10-C.P. lamp are different to those existing in the old 1-C.P. lamp.

However, Mr. Paterson seems to concede that the combined effect of the screening and the fact that the centre of illumination of the flame itself is not exactly on its central axis might justify the centre of illumination being taken 3 millimetres in front of the axis, and this would cause considerable differences at short distances. The point is, however, a difficult one to settle experimentally, and I agree with Mr. Paterson that it is probably best to measure from the central axis of the burner, provided that it is definitely understood that this is the prescribed method. But for accurate work the photometer should certainly be kept 1 metre away from the standard.

With regard to Mr. Paterson's suggestion that a personal effect might partially account for the differences experienced at different distances, I have never met a case in which a personal effect of this kind could be shown to exist for lights of the same colour, while the strength of the illumination of the photometer screen is against the supposition. Moreover, the readings at all distances agreed very closely with one another.

Mr. Paterson seems to be in agreement with my rather vaguely expressed suggestion as to the cause of the gradual fall in candle-power of the lamp in a closed room. The point I wished to make was, that this drop is probably due to a reduction in the available oxygen per cubic metre of air in the room, and that it could not, therefore, scientifically be corrected for by a formula taking into account the amount of carbon dioxide present in the atmosphere.

J. S. Dow.

London, N., *October 15th*, 1906.

Cost of Suction Gas Power.

Replying to your editorial footnote to our letter published in your issue of October 12th, our opinion that you are prejudiced against the suction gas plant, and allow your prejudices to interfere with your judgment, was not formed hastily. We have felt the desirability of writing you for a long time past on this subject. There is such a thing as "damning with faint praise," as well as publishing what may be detrimental to the interest you have no particular reason to support.

We are not aware that we suggested that you should suppress any facts. The suction gas plant, as we know it, will come out very well indeed if you will publish impartially the facts both for and against it.

With regard to the "communicated" article, we look upon you as being responsible for the opinions expressed in it; you fathered it in the very fact that you published it over no man's signature, and if you did not endorse its contents you had no right to insert it in your columns in the position it occupied.

With regard to the last paragraph of your remarks, we did not initiate this correspondence with a view to justifying any figures or statements which you may deem extravagant; but if you want a concrete instance of "20 B.H.P. for an hour for 1d.," we append one for your information. These figures were taken and the test was carried out by the authorities at Broxburn without our knowledge, and we knew nothing of them until we saw them in the issue of the *Electrical Engineer* for July 27th last.

You might tell us, in reply to these data, that the places where anthracite can be obtained at 11s. 6d. per ton are few, and in order to prevent your falling into this further error, and to prevent this correspondence reaching an undue length, we may now say that you can purchase it over practically the whole of Scotland at prices ranging between 9s. and 14s. per ton, and in most cases it is cheaper than ordinary boiler coal. Further, as we remarked in our last, where you cannot get anthracite you can use gas coke.

The difficulty the maker of the suction gas plant usually has to contend with is to get the user to tabulate and record the performance of the plant. It is so very much more economical than the power of which it took the place that the average user is satisfied with it without going into decimal points. To give you an instance, we installed at Aberdeen an engine and suction plant to drive machinery in an ice factory, and were recently informed by the management that their running costs were one-half the costs when using as their motive power a compound non-condensing steam engine. On this we have no doubt they will further improve by a further re-arrangement of their system of driving.

You refer us to a paper in which certain comparative figures are given. *Re* these figures we have at present only to remark that the units in which the competition of the suction gas plant has so far been felt are not units of 500 H.P. It is in units of more like one-tenth this power that the interests you have supported have so far felt the pinch most severely. In saying this we must ask you to bear in mind that we do not by any means accept these figures. We leave them to be dealt with on another occasion.

We conclude by saying that we remain of the opinion that your attitude towards the suction gas plant has not been either fair or impartial, and that every true critic should be in sympathy with the subject of his criticism, which you distinctly have not been.

Extract from the *Electrical Engineer*, July 27th, 1906.

The following figures are from a test made under ordinary working conditions of an 80 B.H.P. "Campbell" suction gas engine:—

Engine developing...	79·24 B.H.P.
Duration of test run	6·75 hours.
Total fuel consumed	405 lb.
Total units generated	376
Fuel consumed per kilowatt	1·07 lb.
Cost per kilowatt	·06d.
Fuel consumed per B.H.P....	·75 lb.
Cost per B.H.P.	·05d.
Cost of anthracite coal in bunker ...	11s. 6d. per ton.

The Campbell Gas Engine Co., Ltd.,
Hugh Campbell.

Halifax, *October 15th*, 1906.

[Our correspondents insist upon their acquaintance with our views being more intimate than our own: the verdict as to our impartiality must therefore be left to our readers. We cannot refrain, however, from commenting on the inconsistency of Messrs. Campbell's attitude. As we showed in our last issue, we *have* published the facts relating to the suction gas plant—both for and against, but mainly for. We have repeatedly published papers, in full or abstract, describing the construction and working of the plant, and accounts of tests. Very seldom have we published facts telling against the system; directly we do so, we are accused of bias and prejudice!

As regards the "communicated" article, our correspondents show a lack of acquaintance with journalistic procedure, together with an obvious wish that we should refuse articles unfavourable to the suction gas system. The word "communicated" was attached to the article *for the express purpose of* dissociating ourselves from its authorship, and this practice is well understood. Many excellent writers are precluded by circumstances from revealing their identity; their writings are none the less valuable and worthy of publication on that account, but we do not accept responsibility for their opinions any more than we do for those of acknowledged authors. Moreover, we have the right to insert any article in any position in our columns that we think fit.

Our correspondents are at liberty to refute any statement which appears in our pages if they can. The example which they give, however, does not help them. The very essence of our complaint, and of that of our contributor, is that the statement of "Twenty B.H.P. for an hour for one penny" is absolutely unjustifiable, even with anthracite at 11s. 6d. per ton, instead of "23s. per ton upwards, delivered in London."

Regarding Mr. Esson's paper, in which the cost of the E.H.P.-hour with suction gas plant of 500 B.H.P. is shown to be ·423d. (= ·57d. per unit, or ·45d. per B.H.P.-hour, or 2·2 B.H.P.-hours for 1d.), are we to understand from Messrs. Campbell that small suction gas plants are more economical than large ones?—Eds. E.R.]

I have just seen Mr. Weaving's letter in yours of the 28th ult., and should like to ask him how he reconciles a cost per unit of 0·97d. with a cost per B.H.P. of (2·9d ÷ 20) = ·145d.

An average load of 44·7 KW. means an average of about 70 B.H.P., or 22,330 B.H.P.-hours in 319 hours.

(£58 1s. 11d. =) 13,943d. ÷ 22,330 = 0·62d. per B.H.P. per hour, or 12·5d. for 20 B.H.P. for one hour.

This agrees approximately with Mr. Weaving's figure of 0·97d. per unit, but knocks the bottom completely out of the misleading—to use no stronger word—advertisements of the suction plant makers "one penny for 20 B.H.P.-hours."

F. W. Goodenough.

London, W., *October 12th*, 1906.

Patents and Prejudice.

In your leader of October 12th on Sir Joseph Lawrence's article on "British Patent Laws," you refer to me as having made a statement concerning our telephone industry, which statement is, on the face of it, so absurd that I should have thought that you would have discerned at once that it must have been based on some misunderstanding. It is evident that Sir Joseph Lawrence in quoting me has left out the gist of my information, and thus conveyed an erroneous impression of what I said. The following is the statement I made:—

"The telephone industry started in England first, and flourished almost from its inception; but, unfortunately, the combination of our fiscal policy and bad patent laws killed it shortly after its prosperous start, and threw it into the hands of foreign nations.

"Had it not been for this, our industry would not only have supplied every requisite for telephones in this country, but also for our Colonies and many foreign nations.

"That industry would have comprised not only the making of transmitters and receivers, but of switchboards, signalling apparatus, insulators, cables, &c.

"This enormous world trade, which, during the past 25 years, represents certainly not less than £30,000,000 sterling, has, by reason of bad laws, been lost to England."

G. Byng.

London, E.C., *October 15th*, 1906.

[A reference to this matter appears in our "Notes" to-day.—Eds. E.R.]

Your editorial under this heading is very interesting. But if, according to Sir Jos. Lawrence, "one of the root causes of our comparative manufacturing decline is the granting of patent monopolies in Great Britain to non-resident foreigners"—why, does it not follow plain as daylight that it should be the simplest possible plan to take the wind out of the sails of these hated non-resident foreigners if British investors and manufacturers were just to put their brains to work and invent and patent all possible profitable ideas just in advance of the H.N.R.F.? That, at least, would go to the root of the "root causes"—moreover, nothing is required but just a little mental exertion and general alertness. Why should that be left along with the spoils to the H.F. non-resident or otherwise? It seems to be a great pity that for the want of these trifles "industrial development and opportunities of employment at home should decline."

Sir Jos. Lawrence is generally supposed to do well in working the British patent of a foreign invention—the linotype. How much better still would he not have done by himself, as a Britisher, making and patenting this invention instead of allowing a H.F. to do so? Why, oh why! did he not do so?

This suggested new policy of doing away with the hated foreigner, by making and patenting all profitable inventions on this side before the H.F. can mature his ideas, should also commend itself to the "practical electrical expert" mentioned in your article. The opportunity would then have gone for the foreigners to come over here to make fortunes out of their British patents, except if—as some "practical electrical experts" do—they come over here to change their foreign name into some British name, which makes all the difference.

A. Sceptic.

May I venture to add a few remarks to your leader in this week's issue? You knocked the bottom out of Sir Joseph Lawrence's statements; but there are a few false bottoms that you left in, perhaps because you considered them so leaky that no one could suppose them capable of holding water for a moment.

Even if we make an assumption that we spend £3 × 10^7 on foreign telephone instruments, it is assumed that if we had not done so our workmen would have had £3 × 10^7 worth of extra employment. But this is based on the assumption that we paid for these telephones in pounds, shillings and pence. But this is absurd; if we take in an extra import we pay by sending out a corresponding extra export. The amount of labour approximately equal to what would have been devoted to making telephones is, therefore, devoted to making goods that have to be exported to pay for the telephones. I am not a Liberal, or a Conservative, or a Radical, or a labourer, and I have no cure to suggest for the downfall of England; in fact, I do not know whether it is taking place or not. I merely urge a consideration that seems to me to be the most elementary political economy, because it is nearly always left out in discussions on imports, whereas it must really be the foundation of the whole matter.

J. Swinburne.

London, S.W., *October 13th*, 1906.

Depreciation and Income-Tax.

A company working a small high-tension electrical supply plant has written off for depreciation 10 per cent. off consumers' meters and 5 per cent. off other plant. The income-tax assessor has reduced this to 5 per cent. and 2½ per cent. respectively.

The writer would be pleased to know what percentage for depreciation the assessors usually allow.

Engineer.

Application of Magnetic Brakes.

The study of efficient braking on our rapidly extending tramway systems is so interesting, and the perfecting of any means which will in any way increase the safety factor in working and diminish the number of accidents due to inadequate braking is so important, that I do not think any apology is necessary for the continuance of this matter in your "Correspondence" columns.

Mr. Yerbury says that he has had in actual trial a device for automatically exciting the magnetic track brake from the trolley wire when the car had reached a pre-determined speed, and I think although the idea is not absolutely new, he deserves credit for being a pioneer in the matter. But I incline to the idea that to put in any device which shall act only when a certain speed limit is exceeded, is to attempt the solution of the problem in the most difficult way.

The braking action is more often wanted—one might say, always wanted—before the car has acquired momentum to the danger degree. To this end, the providing of an equipment as perfect as we possibly can get with our present practice, I have summarised a few notes in the hope that someone will find them helpful. So far as I know, the precise equipment I have suggested is new, but I am quite prepared for someone to remind me of a certain old adage.

1. Don't give the motorman another separate braking movement. In time of stress and excitement he will very probably forget all about it.

2. The most serious accidents have been due to locked wheels and consequent skidding.

3. In the case of skidding, only a track brake is of use, and many engineers hold the magnetic to be the best, although not perfect.

4. Although in contingency (2) the car has acquired considerable momentum, the armatures are stationary and the braking current from the motors is nil.

5. With skidding wheels and controller in full braking position, as any ordinary motorman in an emergency would put it, the connections are such that the motors are in the worst condition to allow the wheel motion to be restored to a useful braking speed.

6. Another source of excitation of the E.M. brake is at hand in the overhead wire, and to get the best practical effect the brake would require re-designing with two distinct and separate windings, one for direct trolley excitation and the other for the ordinary braking circuit.

7. To meet all these conditions is required an automatic switch, with a large safety factor of working, to operate as follows :—

(*a*) Cut out direct trolley excitation when braking motor and deliver current above a pre-determined minimum.

(*b*) Cut in direct excitation on the failure from any cause of the braking current.

(*c*) Keep main braking circuit open until E.M.F. is sufficiently high.

The great disadvantage is the introduction of an automatic switch, but the difficulty is not insuperable.

I shall be pleased to receive any criticism. It is all helpful and—I love it.

Alfred V. Newell.

Manchester, *October* 15*th*, 1906.

Rail Corrugation.

I have read with interest your article on "Rail Corrugation" of October 5th, and am surprised that there is apparently only one man in the congress, who puts it down to electrical reasons.

Some time ago I had the honour of calling attention to this in your journal, which letter read as follows :—

"Having noticed this corrugation in tramway rails, I watched very closely the wear of these rails, and have come to the conclusion that this hollowing, or eating away of the tramway rail tread, has nothing whatever to do with the brakes, but is caused by the sparking of the return current (when leaving the motor) taking place between the wheel and the rail.

"Any night when the track is not perfectly clean, serious sparking can be seen between the rail and the wheel. I venture to think there is no doubt that this is the cause of the uneven wear of the tread, and could only be remedied or largely prevented by keeping the tramway rail tread absolutely clean and free from (insulating) dirt, so that no sparking takes place at the point of contact between the tram-car wheel and the rail."

Horace Boot,
Consulting Engineer and General Manager.

Tunbridge Wells Electricity Works,
October 15*th*, 1906.

[But what about corrugation on steam railways?—EDS. E.R.]

Tramway Costs per Car-mile Run.

In reference to the recent meeting of the Municipal Tramways Association at Leeds, I find on page 338 of the *Tramway and Railway World*, October 4th, 1906, that Mr. J. B. Hamilton, the general manager of the Leeds Corporation, in his presidential address is reported as having stated that an electric tramway costs, including "sinking fund, depreciation and renewals," practically about 7½d. per mile to run.

Owing to the fact that this figure may be indiscriminately quoted (it coming from so authoritative a source) that I consider it misleading, and, therefore, challenge the correctness of the figure (viz., 7½d. per car-mile). I will first argue the point from the conditions that will be most favourable to his statement. Of the large Corporation tramways, to my knowledge, the Leeds system is run with less operating expenses than any other Corporation tramways; therefore my figures to disprove the correctness of the figure will be taken from the tramways of which he is the energetic manager.

Last year on a car-mileage of 7,211,866, the operating expenses were 5·26d. per car-mile. (Note.—Operating expenses include only traffic expenses, general expenses, repairs and maintenance and power expenses.) According to the 7½d. basis, the capital charges, &c., have to be paid out of 7·5d.—5·26d., or 2¼d. per car-mile. Last year they (Leeds) allowed for interest, sinking fund and reserve and renewal funds, roughly £112,000; this works out at approximately 3½d. per car-mile. This plus 5¼d. = 8¾d. per car-mile.

As before stated, this is the most favourable instance I can quote to substantiate the 7½d. basis. Last year the operating expenses at Manchester were 7·10d. per car-mile. Do they pay interest, sinking fund, &c., out of 7·5 — 7·1 = ·4d. per car-mile? Is not 4d. per car-mile nearer the mark? Glasgow operating expenses were 5·8d. per car-mile. I find they allowed about 2d. per car-mile for depreciation and permanent way renewals alone, and for sinking fund and interest about another 1d. per car-mile; total, 8·8d. per car-mile (not including any reserve). Another instance is Liverpool, whose operating expenses alone were 7·46d. per car-mile; for interest and sinking fund alone they allowed 2·174d. per car-mile. This totals to over 9½d. per car-mile (not including depreciation, renewals and reserve).

Taking the average of over 50 tramways, I find the operating expenses per car-mile = 6·56. Do these tramways pay capital charges, &c., out of 1d. per car-mile? Personally, I consider 9½d. to 10d. per car-mile nearer the true amount than 7½d. If I am wrong in my estimate, I shall be pleased to be corrected.

Wm. R. Bowker.

Manchester, *October* 10*th*, 1906.

[Mr. Hamilton did not refer to interest on capital.—EDS. E.R.]

Electric Pumping at Collieries.

May I ask you to insert the following few lines in answer to your correspondent's extraordinary statements with reference to my paper dealing with electrically driven centrifugal pumps? In his criticisms on the paper in question, he endeavoured to distort my statement, that an additional advantage of pumping direct from the inflow levels by separate pumps installed in the various levels, was the clearness of the water. I explained that this arrangement was only *economically* possible by using electrically driven centrifugal pumps in parallel.

Your correspondent now brings up a new point, namely, that the only way to pump is from a common sump. There are, however, many cases where, for various reasons, the pumping from a common sump or reservoir is not advisable, and I am connected with a case where we are pumping from 12 levels, with electrically driven centrifugal pumps in each level, the pumps being connected up in parallel. The first installations of electrically driven centrifugal pumps in several levels, which were connected in series, were, of course, due to the limited lift of each pump—a difficulty which is now met by the improved construction of the pumps with several chambers.

Gerald Hooghwinkel, M.I.M.E., M.I.E.E.

London, S.W., *October* 9*th*, 1906.

ANOTHER ELECTRICAL EXHIBITION.—A correspondent wants to know "When the next Electrical Exhibition is to be held at Olympia?"

INFORMATION RECEIVED.—Our thanks are due to the many readers who replied to the queries in our last issue.

E

BUSINESS NOTES.

Storage Battery Renewals.—Messrs. Pritchetts and Gold, Ltd., of 20, Victoria Street, S.W., wish to remind the trade generally that now is the time when a user of a storage battery, which has been in use for some years, may find that his battery is beginning to wear out, and that it is doubtful whether his old battery will be able to supply all his requirements through the coming winter. The ordinary user of a storage battery is not aware that it is possible in most cases to fit new and up-to-date plates into his old boxes, and remembering that the cost of a new battery is a fairly heavy item, he is inclined to put it off and to economise his light. Messrs. Pritchetts make a speciality of renewing old boxes of all makes, and can generally fit their standard plates into any size of old box. The firm's sales department is now conducted entirely from their London office, 20, Victoria Street, London, S.W.

Destructor Plants.—The Horsfall Destructor Co., Ltd., have just completed several important destructor plants, including, at Falmouth, a power plant for Messrs. Crompton & Co., Ltd. (general contractors for the Corporation electricity scheme), in which the refuse is to be used to generate electric light and power for tramways; and an important plant at St. Petersburg, of eight "high capacity" cells, in which the new "Horsfall" patent system of "mechanical charging" has been embodied. In this system, which is in full operation at Leeds, the objectionable handling of the refuse by workmen is entirely done away with, and a very large saving effected on the working costs. The company has also recently shipped destructor plants to Perth, Western Australia and Singapore; and has in hand a four-cell "back-feed" plant for Dunoon on the Clyde; a two-cell plant for Kingstown, Co. Dublin; and a "mechanically-charged" plant for Newcastle-on-Tyne. The last-named has been somewhat delayed by extra work in the foundations, which the company is carrying out in concrete piles on the "Hennebique" system. The company has also in hand the extension of the "Horsfall" destructor at Stourbridge.

Electrical Schemes in Turkey.—It is reported from Constantinople that the Sultan has at last renounced his opposition to the introduction of the electric light in that city. As a consequence, foreign promoters are seeking to obtain a concession, and their endeavours are attracting special interest locally. Ten years ago the employment of electricity, except for telegraphic purposes, was in principle prohibited in Turkey, whereas to-day lighting stations and electric tramways have already been sanctioned for Beyrout, Damascus and Salonica. In Constantinople itself the electric light has so far only been introduced in some of the Embassies and in the Government buildings, but official circles have hitherto opposed the starting of a public electric supply, the establishment of a telephone service, and the transformation of the existing horse tramway to electric traction. It was said years ago that the resistance was not insurmountable, and that it could be overcome by the payment of an equivalent backsheesh. Those in power at the Palace seem to regard electricity as representing the principal card, which they refuse to play until they have received, it is reported, no less than £120,000. It is comprehensible that foreign promoters have hitherto held back in face of such a payment, especially as the electrical undertaking would be unremunerative at the beginning. At present, however, two groups are endeavouring to secure the electricity concession. One is reported to be closely associated with the Rockefeller group of the United States, and the other is a German electrical company. The former is willing to pay £90,000 as backsheesh, while the German company has offered a few thousand pounds less than that sum. It remains to be seen what will be the result of this competition on truly Turkish principles.

Alleged Theft of Cable.—At West Ham last week, John Warriner, 40, coffee-house keeper, of Stratford, was committed for trial, bail being allowed, on a charge of having stolen cable to the value of £26 odd from a warehouse of the Charing Cross, West End and City Electricity Supply Co.

Electrical Trade in Buenos Ayres.—The *Review of River Plate* for September 21st says:—"Mr. T. Fleming, of the British Westinghouse Co., is at present on a visit to Buenos Ayres. Mr. Wm. Buchanan, chairman of the same company, and Mr. Mills, of the American Westinghouse Co. Export Department, are also in Buenos Ayres on business."

A Handy Calculating Disk.—We have received from Mr. Joseph Wilson, of The Pharmacy, Bedford Park, Chiswick, W., a handy office novelty in the form of a sixpenny calculating disk, by means of which it is easy, by revolving the cards, to ascertain the amount of discount at 2¾ per cent. interest on any and every sum between 1s. and £1,000. Each separate discount or interest requires a separate set of disks, a list of those procurable being printed on the back of the example before us. We have no doubt that this little device will be found to be what it claims to be, namely, a useful time-saver in commerce.

The New Japanese Customs Tariff.—The *Anglo-Japanese Gazette* says that the Board of Customs Appraisers have given the following decisions respecting classification under the new Customs tariff:—Screws, bolts, nuts, washers (as parts of bolts), rivets (blank bolts), pipe connecting pieces such as joints and elbows (as parts of tubes and pipes) will all be entitled to pay duty at the "conventional" rates if made of iron or mild steel. Telegraph or galvanised wire of iron on mild steel will still be assessed at the "conventional" rate of Y 0.256 per 100 kins, or 8s. 10d. per ton. Other wire for conduction of electric current made of copper, insulated, single or twisted of three-phase dynamo or in bundles containing any number of wires, whether protected by lead, iron wire, hemp, &c., or not, will pay the "conventional" rate of 5 per cent. *ad valorem* if intended to be carried overhead; but all kinds of underground or submarine cables for telegraph or telephone purposes will be dutiable at the rate of 20 per cent. *ad valorem* (see No. 390 of New Tariff). Petroleum residue for fuel exceeding 0·875 specific gravity will be dutiable at the rate of Y 1·23 per 100 kins or 2s. 1½d. per cwt. (see No. 172 of New Tariff).

Oil and Waste Savers.—Mr. Chas. Pullan, 57, King's Arcade, Bradford, has the sole and exclusive agency for the sale of the turbine oil and waste reclaiming machines of the Oil and Waste Saving Machine Co., Ltd., of Brussels, for the counties of Derby, Nottingham, Cheshire, Stafford, Lincoln, Warwick and Worcester. We have received an illustrated booklet describing the machines, which we understand are at present being used by many railway, engineering and electricity supply works. We have received some figures to show the saving that can be effected by installing these machines; these show that the maximum working cost for reclaiming 2 cwt. of waste or 8 gross sponge-cloth with a 20-in. machine to be 9s. 4d., but each 1 lb. of material contains 1 lb. of oil, and this ought to be placed to credit of the cost. The machines are entirely self-contained, and have a minimum of wearing parts.

Business in Canada.—An Ottawa correspondent says that since the formation of the Ontario Hydro-Electric Commission and the agitation all over the province for a supply of cheap electrical energy, the calls upon the manufacturers of electric appliances are so great that orders cannot half be filled. The Allis-Chalmers-Bullock Co., at Montreal, have doubled their business during the past 12 months, and, to meet these requirements, have decided to increase their capital from $1,200,000 to $2,500,000, and to immediately call for tenders for the erection of additional shops and extensions.

Germany.—The Electromobile Gesellschaft is the name of a company which has just been formed in Hamburg to construct electrical motor-cars under the Gersabeck patents.

Book Notices.—*Experimenting with Induction Coils.* By H. S. Norrie. London: E. & F. N. Spon. 1906. Price 1s. 6d. net.—This little booklet, of some 73 pages, is apparently written for the amateur. On page 10 three dischargers are shown, but the author omits to mention that the brass pillars are fixed on an insulating base. On page 12 there is a picture of the "outside" of a Gladstone-Lalande cell, which is described as one of the best primary batteries for the experimenter. All the author says about it is:—"One of the forms of copper oxide cells, such as Gladstone-Lalande (fig. 4). This cell uses caustic soda in water, and is extremely easy to handle. It furnishes a large, steady current, and maintains its full strength up to the point when it needs almost entire renewal of its parts. Four to six cells are sufficient for coils giving sparks up to 2 in. in length." In other words, the Lalande cell is the "one-horse shay" the amateur wants, and yet somehow never succeeds in obtaining. The author states that the coil when run off the alternating supply mains "cannot well be run continuously on account of various heating effects." The writer has frequently seen an induction coil running for months on end off an alternating-current supply. On page 69 the "Connections of the Tesla Coil" are referred to, and a sketch on page 70 is given showing certain boxes and terminals, connected together, which is quite useless. With the above exceptions the book will, no doubt, prove interesting to the class for whom it is obviously intended, since it contains descriptions of a large number of really interesting experiments. From the preface the following is extracted, from which the reader can draw his own conclusions:—"The marvellous changes of colour and vivid lightning flashes of the high-tension spark *both in vacuum and in the air*, preclude description. From the fact that most of the experiments are spectacular, it is not feasible to describe them at length without the aid of coloured plates. *And even with their aid*, but a faint conception of the colours could be attempted." This latter sounds like "As far as the eye could see, and further," which the writer once read somewhere.

Table of Properties of Copper Wires for the Principal Gauges in Use in Different Countries. Prepared under the direction of H. M. Hobart. London: Whittaker & Co. 1906. 2s. 6d. net.—The above table includes data respecting the Standard Wire Gauge, the Birmingham Wire Gauge, and the American or Brown and Sharpe Gauge. The following data are given for all three gauges from No. 7/0 s.w.g. (·5 in.) to No. 50 s.w.g. (·001 in.):—Diameters in inches and millimetres for bare s.c.c., d.c.c., and t.c.c. copper wires, and also the cross-sectional areas in inches and metric measures. Resistance per 1,000 ft. and per km. at various temperatures from 0° C. to 100° C. Length in feet and metres and weight in lb. and kg. per one ohm resistance at 20° C., and also the resistance in ohms per lb. and kg. at 20° C. Length in feet and metres per lb. and kg. respectively is also given together with the weight per 1,000 ft. and per km. in both measures. The table is printed in three colours, varnished and mounted on linen, and rollers are attached so that it will hang flat on a wall. It is very well got up, and as the data respecting the various gauges have distinguishing colours, any information desired may be seen almost at a glance. It is certainly the best table relating to copper wires that we have seen.

The Stokers' Catechism. By W. J. Connor. London: E. and F. N. Spon, Ltd. 1906. Price 1s. net.—We cannot say we care for the catechism class of technical book, nor do we think that the author of

this well-meaning book has been very happy in all his answers to the suppositious questions put by the catechism. Many of the answers are sound enough, but it is a little rough on the stoker who has had the flues "thoroughly cleaned and swept" for the inspector to find that he "comes out black as any sweep." Did the inspector come out thus he would certainly report the fact to the discredit of the cleaner. Nor is it a particularly "silly habit" to lift the safety valve when getting up steam. A good deal of sheer error appears in the remainder of this same answer. There is not much wisdom in the answer on page 28 about the injector. We heartily commend the answer to question 27 so long as the cold douching is not done too soon, and the words *blow-off cock* are changed, as we think they were meant to be, for *mud door*. There is a good deal of needless padding in the book, and a repeated error in the shape of 32,000 where 33,000 is intended. We do not know that firemen who care to learn anything by reading will appreciate the colloquial style any better than good English.

Telegraph Secondary Cell Installations. By Arthur Crotch. London: Guilbert Pitman. 1906. Price 2s. 6d. net.—The author of this work, an officer of the engineer-in-chief's department, General Post Office, has certainly produced a very creditable, if an unpretentious, treatise. The book is written from a telegraphic point of view, all large offices in the Postal Telegraph Service having each an installation of accumulators, which are charged either direct from the public supply mains or, if the voltage be unsuitable, from a dynamo driven by a motor. The General Principles, Direct-Current Generators, Direct-Current Motors, Alternating-Current Machines, Transformers and Motor-Generators are briefly but clearly described, there being a notable absence of "padding." The type of cell most in use in the Postal Service is the "Hart," and accordingly a full description is given of this pattern, although briefer descriptions are also given of other types. The general equipment of battery and instrument rooms with accumulators is fully gone into, and the arrangement of the necessary charging and discharging switches is well explained and illustrated. Written by a thoroughly competent man, "Telegraph Secondary Cell Installations" calls for much praise and but little criticism; as a book which deals well with that branch of the subject of which it proposes to treat, it can safely be recommended.

"Proceedings of the American Society of Mechanical Engineers." Vol 28, No. 1, October, 1906. Baltimore, Ind.: The Society, 2,427, York Road.

"The *Electrician* Wireman's, Linesman's and Mains Superintendent's Pocket Book." By F. C. Raphael. 1906-7. London: The *Electrician* Printing and Publishing Co., Ltd. 5s. net.

"The Electron Theory." By E. E. Fournier d'Albe. London: Longmans, Green & Co. 5s. net.

"Elementary Experimental Magnetism and Electricity." By William Allanach. London: Longmans, Green & Co. 3s. 6d.

"Arrears for Gas, &c.: A set of Forms of Application for Payment Arrear Sheets, &c." By A. C. Williams. London: John Allan & Co. 5s. net.

"Proceedings of the American Institute of Electrical Engineers." Vol. XXV, No. 9, September, 1906. New York: The Institute, 95, Liberty Street.

"Quarterly Bulletin of the American Institute of Architects." Vol. VIII, No. 2, July, 1906. Washington, D.C.: The Institute.

"The Journal of the Franklin Institute." Vol. CLXII, No. 4, October, 1906. Philadelphia, Pa.: The Institute. 50 c.

"Conduction of Electricity through Gases." By J. J. Thomson, D.Sc., LL.D. &c. Cambridge and London: The University Press. Second Edition. 16s.

"Modern Steam Turbines." Edited by A. R. Liddell. Vol. I.—The Schulz Steam Turbine for Land and Marine Purposes, by Max Dietrich. London: A. Owen & Co., 28, Regent Street. 5s.

Foster High Voltage Series Lamp.—Messrs. Foster and Co., of Wimbledon, are now manufacturing a lamp of very simple and rigid construction, whose principal advantage is economical burning on the higher voltages, viz., 230 to 250 volts D.C. By a patented arrangement the lamps burn with comparatively low current, ranging about 4 amperes on the aforementioned circuits, but at a consumption not exceeding 500 watts per lamp, unless otherwise specified. In a recent competitive test of some importance, we are informed, the Foster lamp came out first with a consumption of 480 watts when burning two in series on 240 volts D.C., and Messrs. Foster & Co. have orders running into thousands of lamps for houses in Antwerp, Brussels and Paris, while in England, among other important installations, the well-known engineering firm of Messrs. J. Stone & Co., Ltd., of Deptford, have installed some 125 of these lamps. No shunt coil is used to obtain balance in series working, a regular and even feed being maintained by an ingenious but very simple method of weight and force distribution, and the trimming is claimed to be the acme of simplicity.

Catalogues and Lists.—Messrs. John Davis & Son, Derby, Ltd., All Saints Works, Derby.—A large variety of plain strong fittings for incandescent lamps is made by Messrs. John Davis & Son (Derby), Ltd. These include damp and dust-proof fittings of bracket form, pendants, pole-top fittings, pit-sinking or cargo lamp fittings, bulkhead fittings, and various shop window fittings, besides a number of more ornamental indoor brackets, &c. These and other patterns are detailed in their price list of "Protecting Fittings."

Sir W. A. Rose & Co., Upper Thames Street, E.C.—Price card relating to their motor lubricants and engine oils.

Messrs. J. B. Hamilton & Co., Unica Works, South Tottenham, N.—Illustrated list describing briefly their "Unica" silent pinions for electric motor and other purposes; also a circular setting out their prices for cutting the teeth of spur wheels, planing the teeth of bevel wheels, and cutting parallel or taper key-ways.

Messrs. Bagshawe & Co., 2 and 3, Tower Royal, Cannon Street, E.C.—Circular illustrating their chain elevating and conveying appliances.

Messrs. Donovan & Co., 12, Barwick Street, Birmingham.—Two loose priced sheets; one showing wood blocks and casing and capping, the other illustrating their cast-iron water-tight electric fittings finished in black japan and white enamelled reflecting surfaces. The firm also supplies galvanised and vitreous enamelled fittings. Illustrated sheets relating respectively to the Glasgow type of fuseboards and their main switchboards and knife switches.

Messrs. Andrew & Suter, 23, Goswell Road, London, E.C.—Circular giving an illustrated description of a new automatic safety suspension lock, combined with electric coupling for arc lamps, &c., for which they are the authorised selling agents. The firm are also sole agents for the arc lamp carbons of Messrs. G. A. Pestalozzi and Co.

The Electrical Co., Ltd., Charing Cross Road, W.C.—New trade price list of the E.C. incandescent glow lamp, also a new leaflet telling the public how to make electric light cheaper by using Nernst lamps. The latter publication details the special advantages of the Nernst lamps, and states comparatively their cost and that of incandescent lamps, as shown by a three months' trial at a London restaurant.

Messrs. A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—New pamphlet describing their standard designs of R.B. type motor starter panels which were shown in our issue of August 3rd.

Messrs. L. E. Wilson & Co., 20, Cross Street, Manchester.—Illustrated four-page pamphlet describing and giving prices of the Otto flame arc lamp, for which the firm have been appointed sole selling agents for the United Kingdom.

Trade Announcements.—We have already made reference to the dissolution of partnership of Messrs. Wharam and Borland. We now learn that Mr. F. J. Borland is resuming his old line of business at Elmwood Engineering Works, Camp Road, Leeds, and is installing new Anglo-American tools for rapid production.

The Premier Accumulator Co., of Northampton, wish to announce that owing to the increased demand for Premier Accumulators, the company have now moved into larger and more extensive premises, which are entirely on the ground floor and cover over an acre of ground, with a frontage directly on the canal.

The West Ham Corporation Tramways Offices and Depôt are now permanently removed from West Ham Lane to Greengate Street, Plaistow, E.

At their new and enlarged works, which are now nearing completion, at Tinsley, Sheffield, the Brotherhood-Crocker Motors, Ltd., will manufacture all parts of the car throughout; hitherto this has not been entirely the case. This terminates the arrangement they originally had with the firm of Mr. Peter Brotherhood, and, in consequence, has necessitated the changing of their name to Sheffield-Simplex Motor Works, Ltd.

The General Electric Co., Ltd., inform us that on and after Saturday (to-morrow) their London telephone number will be altered from 887 Bank to 3,600 London Wall, and that instead of having eight lines only, as in the past, they will then have ten. This alteration has been effected because they have in the past received many complaints that communications with their office by telephone has been a most difficult matter, on account of the very busy exchange which they were on, and also on account of the amount of work which is done from this building over the telephone. They will have their own private exchange in the building, which will enable customers to be immediately switched through to any department they may require. Furthermore, they are arranging to employ in their telephone exchange room a staff of shorthand operators, so that in the event of a customer ringing up and inquiring for any particular person who may not at the moment be in, this arrangement will enable the inquirer to dictate whatever message may be necessary.

Dissolutions and Liquidations.—Messrs. Walker and Hodgetts, Ltd.—A meeting is to be held at 86, Cannon Street, Manchester, on November 19th, to hear an account of the winding up from the liquidator (Mr. E. A. Radford).

The Motor and Electrical Engineering Co. (Leeds), Ltd.—This company is winding up voluntarily, with Mr. R. A. Smithson, Central Bank Chambers, Leeds, as liquidator.

Barcelona Tramways Co., Ltd.—A meeting is to be held at Moorgate Station Chambers, Moorfields, E.C., to hear an account of the winding up from the liquidator, Mr. J. Barber Glenn.

Deep Leads Electric Transmission Co., Ltd.—A petition for winding up this company is to be heard on October 30th, at the Law Courts, London.

Messrs. Crampton, Oliver & Co., electrical engineers, Bury St. Edmunds.—Messrs. C. Oliver & J. W. Crampton have dissolved partnership. Debts due to the firm should be paid to Mr. A. O. Lusher, Guildhall Street, Bury St. Edmunds; debts owing by the firm will be settled by Mr. C. Oliver.

Bankruptcy Proceedings.—William Leslie, electrical engineer, present address, H.M. Prison, Brixton.—October 26th is the last date for the receipt of proofs for intended dividend by the trustee, Mr. Henry W. Figg, 128A, Queen Victoria Street, E.C.

Reduction of Capital.—The Premier Electric Lamp Co., Ltd. and Reduced.—An order was made on September 25th, reducing the capital from £100,000 to £35,631.

Birmingham Exhibition.—At the Exhibition organised by the Corporation at the new Summer Lane works, the General Electric Co., Ltd., have installed a very comprehensive exhibit, including large flame arc lamps, a punkah fan, a large variety of radiators and other domestic heating appliances, as well as electric lighting fittings. A hairdresser's brush with a motor in the handle is a useful novelty, and Osram lamps, Witton carbons, &c., are shown; but the most attractive feature, as usual, is the exhibit of the manufacture of Robertson lamps in actual operation, which always interests the public.

Milan Exhibition Awards.—We learn that Messrs. Schiff & Co. (who are represented in this country by Messrs. H. G. Mayer & Co.) have secured a gold medal at the Milan Exhibition for their well-known "Ship" carbons. We understand that the medal was only awarded after prolonged and exhaustive tests.

The Vienna house of the Sterling Telephone and Electric Co. have been awarded the Grand Prix and Gold Medal for their exhibit of telephones at the Milan Exhibition.

Exhibition Award.—Messrs. E. Green & Son, Ltd., of Wakefield and Manchester, have been awarded the "Grand Prix" for their economiser exhibit at the International Textile Exhibition, Tourcoing (Nord), France. We understand this now makes 23 highest awards that have been granted to this firm at exhibitions in all parts of the world.

Mining Machinery at Yukon.—The Canadian Westinghouse Co., of Hamilton, Ontario, has been awarded a big contract to build electrical machinery for the Yukon Consolidated Engineering Goldfields Co.

LIGHTING and POWER NOTES.

Acton.—In our issue of 5th inst., we stated that the Council had passed a resolution protesting against the Council embarking upon municipal trading. We are given to understand, however, that it was the Acton Ratepayers' Association which passed a resolution to that effect.

Australia.—Northam (W.A.).—This agricultural centre has for some five years past had in operation a small electric lighting plant of inefficient type, which is now overloaded, and the Council has decided on the recommendation of its consulting engineer to dispose of the plant, and erect a modern station in a central situation. A suitable site has been acquired, and arrangements made with Messrs. W. H. Kidston & Co., Ltd., Perth, for the supply and erection of two B. & W. boilers with superheaters, 200 kw. 460-volt Belliss-E.C.C. steam dynamos, static balancer, switchboard, overhead travelling crane, feed-water heater and pipes. The Council has decided to supply consumers on a flat rate of 6d. per unit for lighting and 4d. per unit for power.

Beverley.—The T.C. has decided to take no further steps at present in the matter of transferring the E.L. order. The Council had been negotiating with a private company for the transfer, but the company suggested that having regard to the low price of gas, it would be advantageous to the Council if it carried out the order and ran the E.L. plant in connection with the Gas Works.

Bo'ness.—An unfortunate deadlock has arisen in connection with an application by the T.C. for powers to borrow a sum of £4,000, to defray excess expenditure on the original scheme and to carry out future extensions. The town clerk intimated to the T.C. that he had forwarded his application to the Secretary for Scotland with a report by Messrs. Burstall & Monkhouse, of London, showing that the original scheme had cost £25,000, and that a sum of £2,000 had been over-spent, in addition to which sum the consulting engineers recommended the Council to ask for other £2,000 for future extensions, in all £4,000. Application was duly made, and after some delay a reply, was received, in which the Under-Secretary said that he was desired by the Secretary for Scotland to direct the attention of the T.C. to the decision in the case of the Sudbury Corporation and the Empire E.L. and P. Co., and to say that, in view of that decision, and of the agreement between the Bo'ness T.C. and the National Electric Construction Co., there appeared to be a difficulty in the Secretary for Scotland granting his consent to the borrowing of further moneys by the T.C. for the purposes of the 1903-4 order. The Under-Secretary suggested that the T.C. should communicate with the B. of T. as to the proper course to adopt in the circumstances. The B. of T. subsequently wrote that it was not prepared to consent to any divestiture by undertakers of their powers under the E.L. order save in cases where special authority in that behalf was obtained by the undertakers by a provision in an Order granted by the Board under the E.L. Acts. The Board remarked that it had before it several cases in which local authorities had entered into agreements of a similar character to that entered into by the Borrowstounness Council, and in order to remove the legal difficulties which had arisen, the parties in certain instances proposed to enter into fresh agreements by which the local authority would lease the existing works to the company, and would transfer its powers to the company (after having first obtained a further Order to enable it to do so), the transfer to be complete, all capital money required for the undertaking during the term of the transfer to be provided by the company, and the existing agreement to be cancelled. A draft form of agreement which had been proposed as a basis for carrying out this procedure was forwarded to the Council. In the event of the procedure outlined therein being adopted by the T.C., the Secretary for Scotland will be prepared to consider an application for consent to the borrowing of such further sum as may be necessary to defray the cost of capital works under the E.L. Order, 1903, up to the date of the transfer of the undertaking. Mr. Cownie, manager of the National Electric Construction Co., in his reply to the clerk, expressed surprise at the action of the Scottish office in the matter. He thought the Bo'ness agreement was perfectly valid, and did not amount to a transfer or divestiture of any of the Council's power under its order. The Provost has remarked that Bo'ness is not alone in this matter, as the Hamilton T.C. shortly intends to apply for another loan.

The T.C. has decided to communicate with the B. of T., and ask whether, in the event of the Council applying for a Private Bill to legalise the present agreement, the Board would oppose such a measure. At the same time it has been agreed to solicit the support of the Lord Advocate and the Solicitor-General and Provost, with a view to getting the agreement pulled through, thus avoiding, if possible, the expense of a private Bill. The unfortunate situation is intensified by the fact that the Council relying on authority being granted, had paid up to the company the over expenditure to the extent of about £2,000 borrowed temporarily from the burgh sinking funds.

Brighton.—The Lighting Committee of the T.C. has recommended that energy for cooking and heating should be supplied outside the borough at a flat rate of 2d. per unit.

Canada—Ontario.—The Ontario Hydro-Electric Commission has published its third report on available water-powers for the cheap generation of electricity. This report covers the Georgian Bay district. For this district the Commission considers that 16,000 h.p. would be required, and recommends that water-powers not yet leased by the Crown be retained for the use of the municipalities concerned. Any future lease should specify the rates at which the Hydro-Electric Commission may obtain a supply of energy. The generating costs per h.p. per 24-hours per annum at various places are given.

Ottawa.—At the Assize Court, on September 29th, Judge Anglin dismissed the suit of the Consumers' Electric Co. against the City for the cost of supplies which went into the electric plant between April 30th, when negotiations were commenced with the company, and July 18th, on which latter date the City took over the consumers' plant.

Clacton-on-Sea.—A L.G.B. inquiry was held last week relative to an application of the Council to borrow £3,500 for E.L. purposes. This further loan was for the laying of extra cables.

Cleveland.—Interesting developments are being effected in the matter of electrical power distribution throughout the Cleveland mines district, which forms one of the most important areas served by the newly-established Cleveland and Durham Electric Power Co., Ltd. We learn that the company proposes to lay out an overhead network which will enable all the mines in Cleveland to tap a supply of power. A double pole line is being run from Grangetown to Spawood, from whence the two lines spread out, one going in a northerly direction by Skelton and Brotton to Skinningrove, and the other continuing almost due east to Lingdale and from thence to Loftus, where it will be linked up with the northern line. The system is being laid out for a maximum load of 6,000 kw. The company is now also carrying out various alterations and extensions to its Grangetown power station, which will alter the existing capacity from four 1,000-kw. turbo-alternators to three 1,500-kw. sets and one 2,000 kw. set. The turbines are being supplied by Messrs. Willans & Robinson. The alternators are of the Westinghouse Co.'s make, and will generate three-phase current at 40 cycles per second and at a pressure of 11,000 volts. The switchboard is also being supplied by the Westinghouse Co., and is of the remote control type. In the boiler house there are at present installed six Niclausse boilers, each with an evaporative capacity of 15,000 lb. of water per hour. Arrangements are also in hand for installing two additional water-tube boilers, each capable of evaporating normally 28,000 lb. of water per hour. It is intended to raise the transmission pressure from 11,000 volts to 20,000 volts by means of step-up transformers in a sub-station immediately adjacent to the Grangetown power house, and to transmit it to four or five sub-stations in the neighbourhood of the mines. It is expected that the whole of the work mentioned above will be completed within seven months. The importance of the Cleveland iron mining is indicated by the fact that it produces ⅛ths of the total ore mined in the U.K.

Continental Notes. — Germany. — The municipal authorities of Dusseldorf have voted a sum of £180,000 for the extension of the E.L. undertaking.

France.—Contracts have just been let for the construction of a generating station at Argenton (Indre). Water power is being utilised.

Coventry.—Mr. H. R. Hooper, on behalf of the L.G.B., conducted an inquiry last week into an application by the Corporation for sanction to borrow £37,432 for E.L. purposes. The various items making up the amount were as follows:—£2,000 for spare pipes for cables; £432 for 17 new arc lamps and posts; and £35,000 for new generating plant and machinery, mains, &c. In 1901 the

E.L. Committee was advised that to put the undertaking on a proper basis for earning profit, it would be necessary to double the capital. Applications for loans were made, and in 1903 a demand for motors for power purposes followed. This was encouraged by the Committee, and in order to cope with it, further application was made to the L.G.B. for the necessary loan to complete the £75,000 which it had been advised to spend on doubling the capital. It was stated that the motor load had converted the concern into a paying one. At the end of March last, the profit was £2,340. The revenue had increased from £5,897 in 1901 to £19,493 in 1906. Mr. J. A. Jeckell stated that the remainder of the old single-phase plant had been scrapped, and the whole of the plant would now be on the two-phase system. There was no opposition to the application.

Elgin.—A plebescite has been taken to decide the question of the introduction of electric lighting in the town. The number of ratepayers who expressed disapproval of the project were 435, while 293 voted in its favour, being a majority against the scheme of 142. The matter has been remitted to the Council in Committee to report.

Glasgow.—At a meeting of the Electricity Committee, the engineer reported that the battery at the St. Andrew's Cross generating station had been renewed and had now been maintained for one year by the Tudor Accumulator Co., and that the company had intimated its willingness to enter into an agreement to maintain the battery for a period of 10 years, at the rate of £250 per annum. The sub-committee agreed to recommend that an agreement be entered into with the company on the terms proposed.

The N.B. Railway Co. has applied for a large additional supply of electrical energy for lighting and power purposes, and the committee, after considering the application, agreed to recommend that a special agreement be entered into with the company upon the following terms, viz.:—(*a*) That the company shall pay, for energy taken for lighting up to 750,000 units per annum, 1½d. per unit; (*b*) for any quantity during such period in excess of 750,000 units, 1d. per unit; (*c*) energy for power purposes shall be supplied at the ordinary rates for supplies for power.

Hindley.—The U.D.C. has decided to oppose the application of the Lancashire Electric Power Co. for a prov. order for E.L. in the district. The Council possesses its own order, and has decided to canvass the compulsory area in order to ascertain the number of probable consumers.

Hemel Hempstead.—The T.C. on October 10th decided to discuss with the Home Counties' Electricity Supply Co. the details of an E.L. scheme in connection with the company's application for a prov. order.

India.—CAWNPORE.—The power station of the Indian Electric Supply and Traction Co., recently completed, is equipped with five Belliss & Morcom engines, aggregating 1,250 H.P., and the boiler plant includes three Stirling water-tube boilers.

LAHORE.—*Indian Engineering* says that a large syndicate, by name the Punjab Power Association, represented in India by Major-Gen. Beresford Lovett, is about to obtain from the Punjab Government a concession to derive water-power from the Bari Doab Canal, the object being to supply electrical energy in bulk to Lahore, Amritsar and other places within a reasonable radius of the power station.

DELHI.—The provision of electric hoists at the E.I. Railway station for handling passengers' luggage and parcels between platforms, has been sanctioned at a cost of £1,800.

The E.I. Railway has also ordered from home a combined engine and dynamo with switchgear, &c., at a cost of about £1,530. It is intended to be installed at the company's collieries, and, as *Indian Engineering* says, the intrinsic value of Indian coal requires the maximum of economy in winning it, and electricity is undoubtedly the cheapest agent.

Kearsley.—Farnworth U.D.C. having approached the Council on the question of supplying energy to Kearsley, a reply has been sent to the effect that terms have been practically settled with the Lancashire Electric Power Co.

Llandinam.—Every house in the village, together with the place of worship, the schools, the village hall and the streets are to be lit by electricity supplied by Mr. David Davies, M.P., from the Plasdinam generating station.

London. — HAMMERSMITH.—The electrical engineer reports that at various times discrepancies had been noticed in the amount of coal used, for which no satisfactory explanations were forthcoming at the time. As the result of some tests of the calorific value of the coal, he found that the heating value varied very considerably. Hence the variation in the quantity of the coal used. This pointed to the necessity of having a clause in the coal contract, binding contractors to supply coal of a certain calorific value. This value can be ascertained by testing each barge of coal whilst being unloaded. The Electricity Committee has adopted the engineer's suggestion, that a "Bombe" type calorimeter be purchased from the Bryan Donkin Co., at a cost of £35.

METROPOLITAN ASYLUMS BOARD.—At the meeting on Saturday last of the Board, the Finance Committee reported that it had passed the estimate of cost forwarded by the Works Committee for the fitting up of the Downs School for electric lighting, the amount of the contract being £2,407; or with contingencies, &c., £2,520. An estimate of £22,600 by the engineer-in-chief for machinery and engineering works in connection with the Belmont Asylum was passed, the amount named including £5,000 for electric lighting, telephones and fire alarms. The seal of the Board was affixed to an agreement with the South Metropolitan Electric Tramways and Lighting Co. for the supply of energy to the Downs School. A scheme for the installation of internal telephones at the North-Eastern Hospital at an estimated cost of £500 was approved.

GREENWICH.—The Public Health Committee of the B.C. reported on Monday that Major Cardew (of Messrs. Preece & Cardew) had expressed his willingness to advise and report to the Council on the question of purifying the atmosphere of the sewers by means of ozone electrically produced, for a fee of £50, and he had therefore been retained on those terms. Major Cardew has visited the borough, and it has been arranged that he shall carry out experiments in connection with the brick sewer running up Westcombe Hill. It is thought that the experiments can be carried out at a very small cost; but in order that the progress shall not be impeded, the Committee has authorised the expenditure of a sum not exceeding £50 in connection with the proposed experiments.

L.C.C.—When the Education Committee recently brought up a recommendation to supply electric light at 3¾d. per unit for a school in South London, some inquiries were made as to the relative cost of gas and electricity, and some members alleged that gas was considerably cheaper. Sir Thomas Brooke-Hitching, in replying, said that with gas the decorations required more frequent renewal. He thought that electricity was cheaper in the long run than gas for indoor lighting. A point we have often emphasised, but one which the gas advocate discreetly supresses.

Louth.—The T.C., replying to an inquiry of the B. of T. as to what steps are being taken to carry out the E.L. order, has intimated with regret that it has no further proposal to submit at the present time.

Middlesbrough.—At a recent meeting of the E.L. Committee, a deputation from the Cleveland and Durham Electric Power Co., Ltd., intimated that it desired to settle once and for all, if possible, the question of the company being able to supply big power consumers in Middlesbrough, and to come to some agreement with the Corporation in the matter. Applications were submitted from Messrs. R. Craggs & Sons, and Messrs. Hughes, Bolckow & Co., asking for permission to be supplied by the company. The Committee decided that the consent of the Corporation be withheld in the case of Messrs. Craggs & Sons, but agreed to consent in the case of the other firm. It also decided that the Power Co. be requested to supply the Corporation with a list of the works in the borough it would like to supply. In the meantime, the electrical engineer is to report fully at the next meeting on the question as to whether it was advisable for the Corporation to enlarge the present plant, the estimated cost and time necessary to carry out the work, and also generally on the whole question.

New Zealand.—WELLINGTON.—A statutory meeting of the ratepayers was held a short time ago in regard to a proposal by the City Council to raise £140,000 for E.L. purposes. The Mayor said that it was not proposed to put a burden on the people, but rather to lighten the existing one. £100,000 of the above sum was for the erection of a new generating station to supply energy for lighting and power. The city is already well provided with an electrciity supply by the City of Wellington Electric Lighting and Power Co. As we have previously noted, the City Council has had under consideration the purchase of the company's works, but the Council decided that the price at which the company was willing to dispose of its undertaking was in excess of its real value. The Mayor stated that an offer of £100,000 had been made to the company, but was refused. The Council seems sanguine as to the success of its scheme, for it proposes to supply energy at 5d. per unit for lighting and 3d. for power, and after allowing for financial charges and depreciation, expects a profit of several thousand pounds per annum. In regard to the company, it appears that it had rights under its Act to dispose of its undertaking to the Council, and certain terms were agreed as to when the works could be taken over. However, no provision, we gather, was made in regard to the company making public each year the amount spent on the works, and the income derived, so the Council was not able to judge correctly the price which it should offer, but deemed the price asked by the company excessive. The public lighting is to be taken over from the company. At present Wellington has 871 incandescent lamps of 20 C.P., 33 arcs of 1,200 C.P., and four incandescents of 50 C.P. installed for public lighting, and is paying the company £3,900 per annum for the lighting of these. At an additional cost of £900 the Council estimates that it can run 1,000 30-C.P. lamps, 33 arcs and 200 larger incandescents.

Ormesby.—The U.D.C. has asked the Cleveland and Durham Electric Power Co. to submit a scheme of E.L. for the streets of the town.

Weymouth.—On the question of extensions at the Corporation Electricity Works to meet the winter's load of 1907-8, Sir A. B. W. Kennedy has reported to the T.C. that it is desirable that a new set of 500 H.P. should be installed, at an approximate cost, including auxiliary plant, of £6,500. It is also recommended that in addition it is necessary to obtain L.G.B. sanction to a loan to cover the cost of further house services, meters, and extension to the distributing mains, bringing the total sum necessary to be borrowed to £10,000. The report was adopted on the 11th inst.

South America.—The Uruguayan Government is sending two engineers to Europe to acquire material for modernising the electric power houses in Monte Video. They will first visit London, and then go to France, Germany, Belgium and Italy.—*Review of the River Plate.*

Worcester.—Some time ago we mentioned that the T.C. had adopted the suggestion of its electrical engineer to shut down the old steam plant at the Powick works, and to run only the water-power plant in that station, all load necessary to be run on the steam plant to be taken up by the Hylton Road station, with a view to more economical working. There is some difficulty, however, in carrying out this decision. It appears that the cost of the old steam plant installed at the Powick station has not yet been paid off, there being £4,072 still outstanding on this account. Recently a meeting of the T.C. was held to consider a recommendation of the Electricity Committee in regard to this. The L.G.B. inspector, who recently conducted the inquiry into further extension, suggested that the T.C. should undertake to pay off the outstanding debt on the old plant out of the rates. This the T.C. has decided to do, and it is to be wiped out in three years in the following instalments:—£1,200, £1,200, £1,672.

Application is again to be made to the L.G.B. for sanction to a loan of £6,500 for plant extensions, &c., at Hylton Road, and in order to obtain such a loan an undertaking is to be given to pay off the debt on the old plant, as mentioned above.

TRAMWAY and RAILWAY NOTES.

Belfast.—The revenue of the City tramways for the six months ending September 30th showed a gross profit of £41,685, and a net profit of £8,240.

Canada.—Hamilton.—The Ontario Railway and Municipal Board has recently held a sitting in Toronto to investigate complaints by the Municipality of Hamilton regarding the system of the Hamilton Electric Street Railway. Messrs. G. E. Diehl, of Messrs. Guthrie & Diehl, consulting electrical engineers, of Buffalo, and Mr. Fred. Gatchell, superintendent of the Electric Street Railway at Gulf Port, Miss., gave technical evidence to the effect that in their opinion the tracks and cars were badly kept, and that the system in general was not a modern one. In some instances the emergency appliances were quite obsolete, and in consequence the tracks and cars were dangerous to operate. The result of the inquiry will be promulgated in due course.

Work is proceeding apace on the construction of the Brentford and Hamilton Electric Railway Co. In terms of the company's franchise $200,000 must have been spent on construction work by November 1st next.

Cheadle and Gatley.—The U.D.C. has passed a resolution declining to give its consent to Manchester T.C. having powers to construct electric tramways in the district.

Clayton-le-Moors.—The U.D.C. has instructed its surveyor to meet the borough surveyor and electrical engineer of Accrington on the question of the electrification of the existing tramways in Clayton-le-Moors.

Continental Notes.—Germany.—The Continental Company for Electrical Enterprises, of Nuremberg, which was responsible for the construction of the suspended electric railway between Eberfeld and Vohwinkel, has been engaged for a period of five years in the promotion of a similar scheme for the German capital, but the question has so far been hampered by committees of the municipal authorities. As projected, the railway would be 7½ miles in length, and would form a connection between Gesundbrunnen and Risdorf, and the company has now gone so far as to consent to the introduction of a uniform fare of 10 pfennigs (1½d.) for the whole or any part of the journey. At the present time the "magistrate" demands the construction of an experimental section in a street which would in future be traversed by the proposed suspended railway. On its part the company offers to build a section 325 ft. long, showing all methods of construction concerned, in a street which would allow of comparison with the existing overhead electric railway, and the junction of Zeughof Strasse and Skalitzer Strasse has been suggested for the work. As it has so far been impossible to arrive at an agreement in regard to the opposing demands, the company has taken the trouble to prepare large models in illustration of four methods of constructing the viaducts for the railway as applicable to the Brunnen Strasse. The models, together with the drawings, have been on exhibition at the town hall in Berlin, and have created a favourable impression among the members of the municipal council. It is hoped that in this way the city authorities will either abandon their demand for the establishment of a trial section or agree to the company's suggestion. At any rate, a decision is expected to take place this winter, and when the opposition of the municipal council has been overcome, it will then be the company's turn to deal with the State supervising authorities.

Italy.—It is announced from Milan that the Mediterranean Railway Co. has applied for a concession for the construction of a new direct electric railway between Milan and Lugano with a connection with the St. Gothard Railway. The period fixed for the completion of the undertaking is the year 1908. In addition, the company desires to extend its old electric line between Varese and Portoceresio along the western bank of Lake Lugano, and for this purpose an agreement has already been concluded with the concessionaire in Lugano in regard to the section on Swiss territory. Another scheme relates to negotiations which are proceeding between a financial group headed by the Società Bancaria Italiana and the North Milan Railway Co. with a view to increasing the capital of the latter from £800,000 to £1,600,000 for the purpose of converting the existing lines to electric traction and constructing a new railway between Milan and Como.

Switzerland.—According to the Swiss *Bund*, the Oerlikon Machine Works Co. has, in conjunction with the Siemens-Schuckert Co., submitted a proposal to the Government to introduce electrical working on the Gothard Railway in connection with the establishment of electric traction on the section Zurich-Thalweil-Zug-Lucerne, and at the same time offered to carry out the work with the assistance of banks, provided that the starting of the electrical service should not take place until the transfer of the railway to the State in 1909. The promoters of the scheme undertake to execute the whole of the electrical work at their own expense and to work the service in return for the payment of the present costs incurred on the steam service up to the period when the Federal Railway Administration takes over the undertaking on terms to be arranged.

Russia.—The Société des Charbonnages de Bielaia (Donetz) is reported to have concluded an arrangement with a Moscow firm for the construction of an electric railway 10 kilometres long to connect its mines with the main line.

Croydon.—The T.C. has authorised its Tramways Committee to prepare the necessary plans, estimates, &c., for an extension of the tramways from Addiscombe to South Norwood, as already sanctioned by Parliament. This will cost £28,750, and the route touches a district in which the population has increased by 10,000 in nine years. The Committee submitted to the T.C. some correspondence with the L.C.C. regarding a proposed extension of the tramways from Norwood Road to Upper Norwood, and the Crystal Palace. The L.C.C. asked permission to run along certain roads in the borough as an alternative route to Westow Hill, to avoid expensive widenings in the latter thoroughfare. Councillor West said that when the Croydon Council wished some time ago to run trams a few yards into the L.C.C. area for the sake of getting a terminus clear of traffic, the concession was practically refused. Now that the boot was on the other foot, he advocated a like attitude. After long discussion, the Council authorised the Committee to continue the negotiations, in an absolutely non-committal way, and report further.

Dudley and Tipton.—The Dudley Corporation has at last sealed the agreement with the South Staffordshire Tramways Lessee Co. (B.E.T. Co.) and the South Staffordshire Tramways Co. in reference to the payment for the electric equipment of tram lines on the Tividale and Tipton Roads. According to this agreement the sum of £2,294 will be paid by the Corporation towards the reconstruction of a short length of tramway at Burnt Tree in the direction of Dudley Ports, and the electric equipment of another short length from Dudley Station to the car-shed. The Corporation will have to pay the actual cost of the reconstruction of the line from the shed to the borough boundary in the Tipton Road, but not the office expenses, and there will be a rebate from the tramway company in respect of old materials at the rate of 10s. 1d. per yd. The agreement should have been signed in March last, but the company wanted to give a good deal less for the old materials than was asked for by the Corporation, hence the delay. It is understood that the reconstruction of the tramway to Tipton within the borough boundary will commence immediately. It is probable that the cars will be running before the end of the winter.

Harlesden.—The High Sheriff of Middlesex opened the new electric tramway between Harlesden and Stonebridge on the 10th inst. The tramway is one of the M.C.C. schemes, and it will be continued from the Harlesden end, along the Harrow Road to Lock Bridge, and from Stonebridge to Sudbury. Already the work of laying down the line through Willesden Green to the Edgware Road and Wood Green lines has been entered upon. The length of line just opened is about two miles.

Huddersfield.—The borough treasurer's financial statement relative to the tramways undertaking for the six months ended September 30th shows a capital outlay to date of £413,795. The miles run are 922,171, against 886,791 last year. The income amounts to £42,360, or 11·03d. per car-mile, compared with £38,299 and 10·36d. last year. The working expenditure totals £20,853, or 5·43d. per car-mile, against £19,010, or 5·14d., leaving a gross surplus of £21,507, or 5·60d., compared with £19,289, or 5·22d. Rent of leased lines absorbs £603; interest on capital, £6,600; and redemption of debt, £4,935; leaving a surplus of £9,369, which equals 2·44d. per car-mile, against £7,031 or 1·90d. last year.

A private conference, convened by the Tramways Committee of the Corporation was held at Huddersfield on the 11th inst., to discuss the brake question. The conference was attended by the managers of most of the undertakings in Yorkshire, as well as by several chairmen of committees, a meeting of the Yorkshire Tramways Managers' Association taking place later in the day, when the power station at Longroyd Bridge was inspected. The Mayor of

Huddersfield (Alderman B. Broadbent), who is also temporary chairman of the Tramways Committee, presided over the Conference. The discussion was of a confidential character.

Glasgow.—The new route from Mount Florida to Paisley Road Toll, *vid* Pollockshields, was opened for traffic on Saturday. The distance is about 2½ miles.

Leeds.—Some figures concerning the City tramways have just been published. For the current year which ends on March 31st next, it is estimated that the undertaking will yield a net revenue of £48,000, whereas for the six months ended September 30th, there is a balance of £32,045. The total revenue for the half-year just concluded amounted to £167,578, an increase of £4,291. The total mileage run was 3,707,537, or a decrease of 10,584. The passengers carried totalled 37,289,126, an increase of 819,205, or 2·4 per cent. The receipts per mile were 11d., as against 10·66d. The traffic expenses were £43,227, as against £43,304. The gross profit was shown to be £86,942, as against £88,053. Deducting therefrom interest on capital, income-tax, contribution to sinking fund and provision for reserve fund, there remained a net balance of £32,045, as against £31,296 for the corresponding half-year of 1905 plus six days more.

London.—L.C.C.—At Tuesday's meeting of the L.C.C. a tabulated return was submitted by the Finance Committee, as a result of a motion adopted last January on the proposal of Captain Swinton, showing (1) the cost of every street widening carried out or authorised by the Council along the route of any tramway existing or sanctioned; (2) the net cost in each case of repaving and other works; (3) the portion of the expenditure which has been or is proposed to be charged to the local authority, the Council's improvement account, or the tramway account; and (4) the amount charged annually against the tramway account in respect of the services of each branch of the Council's central staff. In rising to refer to the return, Captain Swinton stated that municipal trading ventures must be conducted on business lines. The people had been told that the tramways paid one-third of the cost of the right-of-way, but that was not correct. The sum of £4,044,844 had been expended on improvements, but only £377,260 had been charged to the tramways. Deducting £1,007,354 for general traffic improvements, there were three items totalling £1,106,537, which the Council, according to its own annual report, refused to undertake unless it was allowed to double the tramlines. Of that sum only £621 was charged to the tramways, the remainder to the people of London. Another matter unfair to the ratepayers was in connection with the cost of the central office, which had amounted to £1,200,000. Yet the great tramway enterprise had only paid towards that cost in seven years the ridiculous sum of £8,160 on revenue account, and it obtained practically all its legal and clerical assistance for nothing. That was not running a trading concern on business lines; and instead of there being a profit, the tramway system owed London at least £500,000. The people of London had been misled in the matter, but with the return before them no one could talk of "tramway profits," at least until heavy sums had been repaid to London. A long discussion took place, in which Mr. McKinnon Wood, Sir M. Beachcroft, Sir J. W. Benn, Mr. Whittaker Thomson, Capt. Hemphill, and others took part. The debate largely centred round the question of municipal ownership, the recommendations of the Royal Commission on London Locomotion in regard to street widenings and tramways, &c., but there was no direct refutation of the figures put forward by Capt. Swinton as based upon the published return.

The Holborn B.C. has decided upon the recommendation of the reports of its Committee, to oppose the L.C.C. tramway scheme so far as it affects its area. Memorials signed by every householder in Upper Bedford Place and Woburn Place have been presented to the B.C. against the tramways.

One of the double-decked cars running on the new section of the L.C.C. line from Tooting to Battersea Park, ran on to the pavement and crashed into the front of a draper's shop near the Washington Music Hall on Monday last. No injuries were, however, recorded.

St. Pancras.—Notwithstanding a decision of the B.C. against the adoption of the overhead trolley system of traction, in the borough, the L.C.C. has announced its intention of applying for B. of T. approval to the trolley system in regard to the tramways from the Red Cap, Camden Town, to Finsbury Park, and also from the Red Cap, *vid* Chalk Farm Road, Ferdinand Street, and Malden Road, to the Hampstead terminus of the tramways.

Newcastle-on-Tyne.—The engineer and manager of the Corporation tramways submitted estimates on the 11th inst. for the extension of the tramway line which now runs up Barrack Road. It is proposed that the line should be continued up Barrack Road to Fenham, a distance of about 2,000 yards, the estimated cost being £19,800. The Tramways Committee has decided to recommend the T.C. to carry out the work at once, borrowing the money under the present Parliamentary powers. It was also decided that the city engineer should go over the area lying between the Scotswood Road and Westgate Road termini, with the tramways manager, with a view to finding a suitable route by which to make a connection between the two routes.

New Zealand.—Wellington.—The local press recently published the financial result of the working of the City Council's tramways undertaking for the year ended March 31st last. The principal items were as follows:—The total receipts amounted to £77,827, and after setting aside £12,099 to interest charges, £3,064 to sinking fund, and £7,436 to depreciation, there remained a net profit of £1,362. The report and balance sheet has been approved by the Council.

A poll of the ratepayers was taken some weeks ago for sanction to the City Council applying for a loan of £55,152 for further tramway purposes.

South America.—The German Transmarine Electricity Co., of Berlin, announces a further extension of its sphere of activity by the acquisition, after long negotiations, of the Tramway Oriental at Monte Video, for the sum of approximately £300,000. This tramway is complementary to the Tramway al Paso del Molino y Cerro, in Monte Video, which was recently brought within the fold of the German company. As payment for the taking over of the new undertaking, recourse will be had to the funds provided by the recent increase of £1,800,000 in the share capital of the Berlin company. In addition to these two tramways now under German ownership, there are several other lines at Monte Video which are independent of the Teutonic company.

Stirling.—The T.C. has sent to the National Electric Construction Co. the terms on which it is prepared to supply energy to the company for traction purposes. These are:—2d. per unit for the first 100,000 units per annum; 1½d. for the next 50,000 units, 1¼d. for the next 50,000 units, 1¼d. for the next 50,000 units, and 1d. for additional units. The T.C. also stated that it was prepared to undertake the maintenance of the track within the burgh on payment by the company of £100 per mile of single track. It was also prescribed that cars shall only be run on Sundays if the ratepayers approve so by poll. The company has stated that it cannot give the price proposed for energy and makes an alternative offer; it cannot agree to the terms asked for maintenance of track, and will not proceed with the scheme without Sunday running; also that it cannot continue the present payment of £25 per annum, and must have a 42 years' concession. The T.C. agreed on having another conference with the other local authorities.

Surbiton.—The U.D.C. has decided to ask the B. of T. to appoint a referee to settle the differences which have arisen between the Council and the L.U.T. Co. The Council, we gather, demand that the company shall do various highway work, and also pay £94 10s. to its surveyor for his supervision of the construction work.

TELEGRAPH and TELEPHONE NOTES.

Berne.—The Bureau International des Administrations Télégraphiques announces the issue of a new "Carte des Communications Télégraphiques du Régime Européen."

Bolivia.—The Republic of Bolivia has officially notified its adherence to the International Telegraph convention of St. Petersburg.

Canada.—From latest advices it does not seem that there is now any great likelihood of the Dominion Government adopting wireless telegraphy to Dawson City. The Marconi Co. have modified their original offer to the Public Works Department to install their system, and will only do so now under a Government guarantee. It is hardly likely, therefore, that the Government will make any change in existing conditions except to improve the telegraph line where necessary.

French Cables.—The French Administration officially announces the opening to international service of the two cables between Réunion, Madagascar and Mauritius.

German Cables.—The *Revue Industrielle* of October 6th publishes an article on German submarine telegraphs, stating that Germany now possesses about 30,000 kilometres of cable, and is independent of cables owned by England. It is also stated that the Shanghai-Yap cable, in the neighbourhood of the Linkin Islands, is laid at a depth of 8,000 metres—*i.e.*, 4,368 fathoms.

Hull Telephones.—A special meeting of the Hull Council was held last week to consider a motion urging the Corporation to open negotiations with the National Telephone Co. or the Postmaster-General, with a view to selling the municipal telephone service. The proposal was defeated by 39 votes to 13.

Paris-Brussels Telegraph.—After considerable negotiation between the Belgian and French Governments it has been decided to install the Baudot apparatus between Paris and Brussels. The number of telegrams passing between these two cities averaged 2,000 per day, and the two Hughes sets were found to be insufficient to cope with the traffic. The Belgian staff has been trained in the use of the new apparatus by a member of the French Administration, and will commence its work almost immediately. Curiously enough, Brussels is the last of the European capitals working with Paris to adopt the Baudot, which, for several years, has been working regularly with London, Berlin, Basle, Milan, Rome, Madrid and St. Petersburg.

Paris Telephones.—According to the *Tribune*, the Stock Exchange operators have resolved to boycott the telephone and transact all their business by telegraph. The reason of their decision is the resentment aroused among them by some new

South America.—The Uruguayan Government is sending two engineers to Europe to acquire material for modernising the electric power houses in Monte Video. They will first visit London, and then go to France, Germany, Belgium and Italy.—*Review of the River Plate.*

Worcester.—Some time ago we mentioned that the T.C. had adopted the suggestion of its electrical engineer to shut down the old steam plant at the Powick works, and to run only the water-power plant in that station, all load necessary to be run on the steam plant to be taken up by the Hylton Road station, with a view to more economical working. There is some difficulty, however, in carrying out this decision. It appears that the cost of the old steam plant installed at the Powick station has not yet been paid off, there being £4,072 still outstanding on this account. Recently a meeting of the T.C. was held to consider a recommendation of the Electricity Committee in regard to this. The L.G.B. inspector, who recently conducted the inquiry into further extension, suggested that the T.C. should undertake to pay off the outstanding debt on the old plant out of the rates. This the T.C. has decided to do, and it is to be wiped out in three years in the following instalments:—£1,200, £1,200, £1,672.

Application is again to be made to the L.G.B. for sanction to a loan of £6,500 for plant extensions, &c., at Hylton Road, and in order to obtain such a loan an undertaking is to be given to pay off the debt on the old plant, as mentioned above.

TRAMWAY and RAILWAY NOTES.

Belfast.—The revenue of the City tramways for the six months ending September 30th showed a gross profit of £41,685, and a net profit of £8,240.

Canada.—Hamilton.—The Ontario Railway and Municipal Board has recently held a sitting in Toronto to investigate complaints by the Municipality of Hamilton regarding the system of the Hamilton Electric Street Railway. Messrs. G. E. Diehl, of Messrs. Guthrie & Diehl, consulting electrical engineers, of Buffalo, and Mr. Fred. Gatchell, superintendent of the Electric Street Railway at Gulf Port, Miss., gave technical evidence to the effect that in their opinion the tracks and cars were badly kept, and that the system in general was not a modern one. In some instances the emergency appliances were quite obsolete, and in consequence the tracks and cars were dangerous to operate. The result of the inquiry will be promulgated in due course.

Work is proceeding apace on the construction of the Brentford and Hamilton Electric Railway Co. In terms of the company's franchise $200,000 must have been spent on construction work by November 1st next.

Cheadle and Gatley.—The U.D.C. has passed a resolution declining to give its consent to Manchester T.C. having powers to construct electric tramways in the district.

Clayton-le-Moors.—The U.D.C. has instructed its surveyor to meet the borough surveyor and electrical engineer of Accrington on the question of the electrification of the existing tramways in Clayton-le-Moors.

Continental Notes.—Germany.—The Continental Company for Electrical Enterprises, of Nuremberg, which was responsible for the construction of the suspended electric railway between Eberfeld and Vohwinkel, has been engaged for a period of five years in the promotion of a similar scheme for the German capital, but the question has so far been hampered by committees of the municipal authorities. As projected, the railway would be 7½ miles in length, and would form a connection between Gesundbrunnen and Risdorf, and the company has now gone so far as to consent to the introduction of a uniform fare of 10 pfennigs (1½d.) for the whole or any part of the journey. At the present time the "magistrate" demands the construction of an experimental section in a street which would in future be traversed by the proposed suspended railway. On its part the company offers to build a section 325 ft. long, showing all methods of construction concerned, in a street which would allow of comparison with the existing overhead electric railway, and the junction of Zeughof Strasse and Skalitzer Strasse has been suggested for the work. As it has so far been impossible to arrive at an agreement in regard to the opposing demands, the company has taken the trouble to prepare large models in illustration of four methods of constructing the viaducts for the railway as applicable to the Brunnen Strasse. The models, together with the drawings, have been on exhibition at the town hall in Berlin, and have created a favourable impression among the members of the municipal council. It is hoped that in this way the city authorities will either abandon their demand for the establishment of a trial section or agree to the company's suggestion. At any rate, a decision is expected to take place this winter, and when the opposition of the municipal council has been overcome, it will then be the company's turn to deal with the State supervising authorities.

Italy.—It is announced from Milan that the Mediterranean Railway Co. has applied for a concession for the construction of a new direct electric railway between Milan and Lugano with a connection with the St. Gothard Railway. The period fixed for the completion of the undertaking is the year 1908. In addition, the company desires to extend its old electric line between Varese and Portoceresio along the western bank of Lake Lugano, and for this purpose an agreement has already been concluded with the concessionaire in Lugano in regard to the section on Swiss territory. Another scheme relates to negotiations which are proceeding between a financial group headed by the Società Bancaria Italiana and the North Milan Railway Co. with a view to increasing the capital of the latter from £800,000 to £1,600,000 for the purpose of converting the existing lines to electric traction and constructing a new railway between Milan and Como.

Switzerland.—According to the Swiss *Bund*, the Oerlikon Machine Works Co. has, in conjunction with the Siemens-Schuckert Co., submitted a proposal to the Government to introduce electrical working on the Gothard Railway in connection with the establishment of electric traction on the section Zurich-Thalweil-Zug-Lucerne, and at the same time offered to carry out the work with the assistance of banks, provided that the starting of the electrical service should not take place until the transfer of the railway to the State in 1909. The promoters of the scheme undertake to execute the whole of the electrical work at their own expense and to work the service in return for the payment of the present costs incurred on the steam service up to the period when the Federal Railway Administration takes over the undertaking on terms to be arranged.

Russia.—The Société des Charbonnages de Bielaia (Donetz) is reported to have concluded an arrangement with a Moscow firm for the construction of an electric railway 10 kilometres long to connect its mines with the main line.

Croydon.—The T.C. has authorised its Tramways Committee to prepare the necessary plans, estimates, &c., for an extension of the tramways from Addiscombe to South Norwood, as already sanctioned by Parliament. This will cost £28,750, and the route touches a district in which the population has increased by 10,000 in nine years. The Committee submitted to the T.C. some correspondence with the L.C.C. regarding a proposed extension of the tramways from Norwood Road to Upper Norwood, and the Crystal Palace. The L.C.C. asked permission to run along certain roads in the borough as an alternative route to Westow Hill, to avoid expensive widenings in the latter thoroughfare. Councillor West said that when the Croydon Council wished some time ago to run trams a few yards into the L.C.C. area for the sake of getting a terminus clear of traffic, the concession was practically refused. Now that the boot was on the other foot, he advocated a like attitude. After long discussion, the Council authorised the Committee to continue the negotiations, in an absolutely non-committal way, and report further.

Dudley and Tipton.—The Dudley Corporation has at last sealed the agreement with the South Staffordshire Tramways Lessee Co. (B.E.T. Co.) and the South Staffordshire Tramways Co. in reference to the payment for the electric equipment of tram lines on the Tividale and Tipton Roads. According to this agreement the sum of £2,294 will be paid by the Corporation towards the reconstruction of a short length of tramway at Burnt Tree in the direction of Dudley Ports, and the electric equipment of another short length from Dudley Station to the car-shed. The Corporation will have to pay the actual cost of the reconstruction of the line from the shed to the borough boundary in the Tipton Road, but not the office expenses, and there will be a rebate from the tramway company in respect of old materials at the rate of 10s. 1d. per yd. The agreement should have been signed in March last, but the company wanted to give a good deal less for the old materials than was asked for by the Corporation, hence the delay. It is understood that the reconstruction of the tramway to Tipton within the borough boundary will commence immediately. It is probable that the cars will be running before the end of the winter.

Harlesden.—The High Sheriff of Middlesex opened the new electric tramway between Harlesden and Stonebridge on the 10th inst. The tramway is one of the M.C.C. schemes, and it will be continued from the Harlesden end, along the Harrow Road to Lock Bridge, and from Stonebridge to Sudbury. Already the work of laying down the line through Willesden Green to the Edgware Road and Wood Green lines has been entered upon. The length of line just opened is about two miles.

Huddersfield.—The borough treasurer's financial statement relative to the tramways undertaking for the six months ended September 30th shows a capital outlay to date of £413,795. The miles run are 922,171, against 886,791 last year. The income amounts to £42,360, or 11·03d. per car-mile, compared with £38,299 and 10·36d. last year. The working expenditure totals £20,853, or 5·43d. per car-mile, against £19,010, or 5·14d., leaving a gross surplus of £21,507, or 5·60d., compared with £19,289, or 5·22d. Rent of leased lines absorbs £603; interest on capital, £6,600; and redemption of debt, £4,935; leaving a surplus of £9,369, which equals 2·44d. per car-mile, against £7,031 or 1·90d. last year.

A private conference, convened by the Tramways Committee of the Corporation was held at Huddersfield on the 11th inst., to discuss the brake question. The conference was attended by the managers of most of the undertakings in Yorkshire, as well as by several chairmen of committees, a meeting of the Yorkshire Tramways Managers' Association taking place later in the day, when the power station at Longroyd Bridge was inspected. The Mayor of

Huddersfield (Alderman B. Broadbent), who is also temporary chairman of the Tramways Committee, presided over the Conference. The discussion was of a confidential character.

Glasgow.—The new route from Mount Florida to Paisley Road Toll, *viâ* Pollockshields, was opened for traffic on Saturday. The distance is about 2½ miles.

Leeds.—Some figures concerning the City tramways have just been published. For the current year which ends on March 31st next, it is estimated that the undertaking will yield a net revenue of £48,000, whereas for the six months ended September 30th, there is a balance of £32,045. The total revenue for the half-year just concluded amounted to £167,578, an increase of £4,291. The total mileage run was 3,707,537, or a decrease of 10,584. The passengers carried totalled 37,289,126, an increase of 819,205, or 2·4 per cent. The receipts per mile were 11d., as against 10·66d. The traffic expenses were £43,227, as against £43,304. The gross profit was shown to be £86,942, as against £88,053. Deducting therefrom interest on capital, income-tax, contribution to sinking fund and provision for reserve fund, there remained a net balance of £32,045, as against £31,296 for the corresponding half-year of 1905 plus six days more.

London.—L.C.C.—At Tuesday's meeting of the L.C.C. a tabulated return was submitted by the Finance Committee, as a result of a motion adopted last January on the proposal of Captain Swinton, showing (1) the cost of every street widening carried out or authorised by the Council along the route of any tramway existing or sanctioned; (2) the net cost in each case of repaving and other works; (3) the portion of the expenditure which has been or is proposed to be charged to the local authority, the Council's improvement account, or the tramway account; and (4) the amount charged annually against the tramway account in respect of the services of each branch of the Council's central staff. In rising to refer to the return, Captain Swinton stated that municipal trading ventures must be conducted on business lines. The people had been told that the tramways paid one-third of the cost of the right-of-way, but that was not correct. The sum of £4,044,844 had been expended on improvements, but only £377,260 had been charged to the tramways. Deducting £1,007,354 for general traffic improvements, there were three items totalling £1,106,537, which the Council, according to its own annual report, refused to undertake unless it was allowed to double the tramlines. Of that sum only £621 was charged to the tramways, the remainder to the people of London. Another matter unfair to the ratepayers was in connection with the cost of the central office, which had amounted to £1,200,000. Yet the great tramway enterprise had only paid towards that cost in seven years the ridiculous sum of £8,160 on revenue account, and it obtained practically all its legal and clerical assistance for nothing. That was not running a trading concern on business lines; and instead of there being a profit, the tramway system owed London at least £500,000. The people of London had been misled in the matter, but with the return before them no one could talk of "tramway profits," at least until heavy sums had been repaid to London. A long discussion took place, in which Mr. McKinnon Wood, Sir M. Beachcroft, Sir J. W. Benn, Mr. Whittaker Thomson, Capt. Hemphill, and others took part. The debate largely centred round the question of municipal ownership, the recommendations of the Royal Commission on London Locomotion in regard to street widenings and tramways, &c., but there was no direct refutation of the figures put forward by Capt. Swinton as based upon the published return.

The Holborn B.C. has decided upon the recommendation of the reports of its Committee, to oppose the L.C.C. tramway scheme so far as it affects its area. Memorials signed by every householder in Upper Bedford Place and Woburn Place have been presented to the B.C. against the tramways.

One of the double-decked cars running on the new section of the L.C.C. line from Tooting to Battersea Park, ran on to the pavement and crashed into the front of a draper's shop near the Washington Music Hall on Monday last. No injuries were, however, recorded.

St. Pancras.—Notwithstanding a decision of the B.C. against the adoption of the overhead trolley system of traction, in the borough, the L.C.C. has announced its intention of applying for B. of T. approval to the trolley system in regard to the tramways from the Red Cap, Camden Town, to Finsbury Park, and also from the Red Cap, *viâ* Chalk Farm Road, Ferdinand Street, and Malden Road, to the Hampstead terminus of the tramways.

Newcastle-on-Tyne.—The engineer and manager of the Corporation tramways submitted estimates on the 11th inst. for the extension of the tramway line which now runs up Barrack Road. It is proposed that the line should be continued up Barrack Road to Fenham, a distance of about 2,000 yards, the estimated cost being £19,800. The Tramways Committee has decided to recommend the T.C. to carry out the work at once, borrowing the money under the present Parliamentary powers. It was also decided that the city engineer should go over the area lying between the Scotswood Road and Westgate Road termini, with the tramways manager, with a view to finding a suitable route by which to make a connection between the two routes.

New Zealand.—Wellington.—The local press recently published the financial result of the working of the City Council's tramways undertaking for the year ended March 31st last. The principal items were as follows:—The total receipts amounted to £77,827, and after setting aside £12,099 to interest charges, £3,064 to sinking fund, and £7,436 to depreciation, there remained a net profit of £1,362. The report and balance sheet has been approved by the Council.

A poll of the ratepayers was taken some weeks ago for sanction to the City Council applying for a loan of £55,152 for further tramway purposes.

South America.—The German Transmarine Electricity Co., of Berlin, announces a further extension of its sphere of activity by the acquisition, after long negotiations, of the Tramway Oriental at Monte Video, for the sum of approximately £300,000. This tramway is complementary to the Tramway al Paso del Molino y Cerro, in Monte Video, which was recently brought within the fold of the German company. As payment for the taking over of the new undertaking, recourse will be had to the funds provided by the recent increase of £1,800,000 in the share capital of the Berlin company. In addition to these two tramways now under German ownership, there are several other lines at Monte Video which are independent of the Teutonic company.

Stirling.—The T.C. has sent to the National Electric Construction Co. the terms on which it is prepared to supply energy to the company for traction purposes. These are:—2d. per unit for the first 100,000 units per annum; 1¾d. for the next 50,000 units, 1½d. for the next 50,000 units, 1¼d. for the next 50,000 units, and 1d. for additional units. The T.C. also stated that it was prepared to undertake the maintenance of the track within the burgh on payment by the company of £100 per mile of single track. It was also prescribed that cars shall only be run on Sundays if the ratepayers approve so by poll. The company has stated that it cannot give the price proposed for energy and makes an alternative offer; it cannot agree to the terms asked for maintenance of track, and will not proceed with the scheme without Sunday running; also that it cannot continue the present payment of £25 per annum, and must have a 42 years' concession. The T.C. agreed on having another conference with the other local authorities.

Surbiton.—The U.D.C. has decided to ask the B. of T. to appoint a referee to settle the differences which have arisen between the Council and the L.U.T. Co. The Council, we gather, demand that the company shall do various highway work, and also pay £94 10s. to its surveyor for his supervision of the construction work.

TELEGRAPH and TELEPHONE NOTES.

Berne.—The Bureau International des Administrations Télégraphiques announces the issue of a new "Carte des Communications Télégraphiques du Régime Européen."

Bolivia.—The Republic of Bolivia has officially notified its adherence to the International Telegraph convention of St. Petersburg.

Canada.—From latest advices it does not seem that there is now any great likelihood of the Dominion Government adopting wireless telegraphy to Dawson City. The Marconi Co. have modified their original offer to the Public Works Department to install their system, and will only do so now under a Government guarantee. It is hardly likely, therefore, that the Government will make any change in existing conditions except to improve the telegraph line where necessary.

French Cables.—The French Administration officially announces the opening to international service of the two cables between Réunion, Madagascar and Mauritius.

German Cables.—The *Revue Industrielle* of October 6th publishes an article on German submarine telegraphs, stating that Germany now possesses about 30,000 kilometres of cable, and is independent of cables owned by England. It is also stated that the Shanghai-Yap cable, in the neighbourhood of the Linkin Islands, is laid at a depth of 8,000 metres—*i.e.*, 4,368 fathoms.

Hull Telephones.—A special meeting of the Hull Council was held last week to consider a motion urging the Corporation to open negotiations with the National Telephone Co. or the Postmaster-General, with a view to selling the municipal telephone service. The proposal was defeated by 39 votes to 13.

Paris-Brussels Telegraph.—After considerable negotiation between the Belgian and French Governments it has been decided to install the Baudot apparatus between Paris and Brussels. The number of telegrams passing between these two cities averaged 2,000 per day, and the two Hughes sets were found to be insufficient to cope with the traffic. The Belgian staff has been trained in the use of the new apparatus by a member of the French Administration, and will commence its work almost immediately. Curiously enough, Brussels is the last of the European capitals working with Paris to adopt the Baudot, which, for several years, has been working regularly with London, Berlin, Basle, Milan, Rome, Madrid and St. Petersburg.

Paris Telephones.—According to the *Tribune*, the Stock Exchange operators have resolved to boycott the telephone and transact all their business by telegraph. The reason of their decision is the resentment aroused among them by some new

regulations introduced by the telephone administration prohibiting the admittance of anyone into the telephone room at the Bourse save those actually occupying telephone cabins.

Russia.—The Russian telegraph system is divided into four systems, viz., lines of the Administration of Posts and Telegraphs, railway telegraph lines, private companies' lines, and military and police lines. In 1903 the length of line belonging to each system was 105,423, 53,435, 191·5 and 1·8 kilometres respectively, while that of wire was 210,688, 170,916, 191·5 and 97·5 respectively. The increase of State and railway lines amounted to 6,964 kilometres of line, and 30,370 kilometres of wire; 107 new offices were opened during the year, and there was one telegraph office for every 42,172 inhabitants and 121·9 kilometres of wire. The railway telegraph system increased by 1,313 kilometres of line, 4,664 kilometres of wire and 52 offices to 68,111 kilometres of line, 183,243 of wire and 3,510 offices.

Traffic.—Local telegrams amounted to 17,730,520, being an increase of 547,951 over the previous year, the average number of words per message being 14·31. International telegrams amounted to 2,891,023, an increase of 187,503 telegrams, the average number of words per message being 13·27. There were also 246,267 telegrams in transit for other countries, so that the total number of all telegrams dealt with was 20,867,810, showing an increase of 754,5197; 11,032 of the inland and 19,841 of the International telegrams were "reply paid," and 349,537 and 64,457 of the same services were "urgent." The services numbered 18,782 for official purposes, 1,469,491 on account of the telegraphic service, and 106,304 on account of the meteorological service. As regards telegrams exchanged with other European countries, Germany heads the list with 1,087,934, then follows Great Britain with 419,406, France with 321,282, Austria-Hungary with 217,974, and Belgium with 97,965. China is first among countries other than those in Europe with 35,732, while America is only placed at 25,968. 59,306 telegrams, containing 578,617 words, passed over the Government landlines; 51,470 of these, containing 470,222 words, were sent *vid* Vladivostock. The Indo-European lines transmitted 186,961 telegrams, representing 2,626,290 words. The Railway Telegraph Service dealt with 95,804,907 service telegrams, being an increase of 1,168,295 over the previous year. Besides these, 64,109 messages were sent by passengers, while other private messages exchanged with the Government offices totalled 3,695,263.

The military and police services were responsible for 2,166,303 telegrams.

There were 630 claims for refund received on account of the international traffic, of which 375 were recognised and settled for the sum of 462,950 fr. (£185), this sum also including moneys paid for 105 admitted local claims.

Telephones.—The Government erected new lines which could be used either for the telegraph or telephone service between Sebastopol and Ialta, Odessa and Kischiney, Jaroslar and Rybinsk, and between Eupatorie and Saki.

The number of subscribers in St. Petersburg was 8,048; in Moscow, 4,604; in Warsaw, 3,598; in Riga, 2,417; and in Odessa, 1,944. Receipts on account of the telegraph service amounted to 78,110,236 fr. (£3,124,409), and the expenses to 11,174,900 fr. (£446,996), while the corresponding figures for the telephone service were 8,279,128 fr. (£331,165), and 3,114,736 fr. (£124,589) respectively.—*Journal Télégraphique.*

Telegraph Boys' Strike.—The *Daily Telegraph* reports that after a two days' strike some hundreds of postal and telegraph boys in New York City returned to work. They were getting 2d. per message, and demanded 2½d. This was refused, but concessions were made regarding the payment for uniforms and overtime. This the boys, whose ages range from 14 upwards, claim as a moral victory. The boys, it is stated, generally earn from 24s. to 32s. weekly, and their strike caused much inconvenience in the busiest quarter of the city.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Trinidad-Demerara (No. 1.)	.. Aug. 26, 1901 ..	..
Cayenne-Pinheiro	.. Aug. 15, 1902 ..	..
St. Lucia-Martinique	.. May 7, 1902 ..	..
Dominica-Martinique	.. May 7, 1902 ..	..
.. Guadeloupe	.. Oct. 21, 1906 ..	..
Guadeloupe-Martinique	.. Aug. 29, 1906 ..	..
Mole St. Nicholas-Port au Prince	.. Aug. 16, 1906 ..	..
Curacao-Coro		
Curacao-La Guayra } Closed..	.. Jan. 12, 1906 ..	..
Curacao-Maracaibo		
Reissa-Issa and Reissa-Yemani (Yemen)..	.. Oct. 22, 1902 ..	..
Tarifa-Tangier	.. Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)	.. Mar. 9, 1904 ..	..
Garachico Santa Cruz	.. July 12, 1906 ..	..
Las Palmas-Arecife	.. Aug. 18, 1906 ..	..

Telephone Tariffs.—According to the *Daily Mail*, the National Telephone Co. is contemplating the abolition of the "inclusive charge," which gives a subscriber a right to unlimited use of the telephone, with a view to substituting a pure message-rate tariff.

Wireless Telegraph Conference.—It was reported in a *Standard* Berlin dispatch, that the American and German Governments had agreed jointly to oppose the endeavour of the British delegates to uphold the interests of the Marconi Wireless Co. at the conference now being held in that city. This should be an additional incentive to the British delegates to do their utmost to carry their point and safeguard British interests. The American and German Governments are already sufficiently keen trade rivals, and have captured many markets and industries formerly entirely British. These nations are freeing themselves from their reliance on British cables and telegraph systems, and are constructing their own lines of communication, in some cases dangerously striking British lines by competition. The American-Dutch-German cable partnership is sufficiently menacing, and there is no doubt that unless a very firm stand be now taken at the wireless conference British wireless telegraph interests will suffer; although the fight may be a long and arduous one, if the interests of the British system be finally secured, it is worth undertaking. It would be an absurd result if wireless systems became international and the Marconi Co. did not secure the right to erect stations and supply their installations to anybody anywhere, and to have existing as well as future stations and their employés recognised by the various governments, and treated on the same footing with their own national stations.

Wireless Telegraphy.—The Gesellschaft für Drahtlose Telegraphie, Berlin, took the opportunity, whilst the delegates were in Berlin for the Wireless Telegraph Conference, of showing them their new offices in Tempelhofer Ufer, 9, and of giving a very instructive and interesting demonstration of their apparatus. Count Arco pointed out that there was now nothing to prevent all systems of wireless telegraphy from communicating with one another, as the wave lengths could be determined as required. The task of the Conference was to establish standards for this purpose, thus extending the field of wireless telegraphy very considerably. Count Arco further mentioned the inventions of Mr. Duddell and of Herr Poulsen, which had as their object the prevention, as far as possible, of outside disturbances by the use of undamped, instead of damped, oscillations. The Telefunken Co., he said, was in a position to produce, independently of the Poulsen patent, undamped oscillations of equal strength. The above statements were then practically demonstrated by means of models in the Exhibition Hall, and wireless telegrams were exchanged with the station at Schiffbauerdamm. The visit came to a conclusion with electrical resonance experiments, trials with undamped waves and with a station at a distance of about 300 kilometres.

According to the Buenos Ayres Press, the Compania Marconi de Telegrafia sin Hilos del Rio de la Plata is now busy with the installation of wireless telegraph apparatus in the Argentine Republic under the terms of the concession which has been granted to it. One station is situated at the works of the company, another will be situated at the Oficina del Trust de Acciones Marconi, and a third at the Banco de la Provincia.

Several important letters on the subject of wireless telegraphy have appeared in the *Times* over the signatures of Prof. S. P. Thompson, Sir W. H. Preece, Lord Kelvin, and Sir Edward Sassoon; we must postpone further reference to these until next week.

The Lines of Current in Storage Batteries.—According to M. A. Schoop in the *Electro-chemical and Metallurgical Industry*, Vol. IV, Nos. 7 and 8, the distribution of lines of current in storage batteries has a marked influence on the life of the plates, but very little attention has been paid to this subject. That these lines of current completely fill the containing vessel, may be easily proved by means of a small apparatus called the "analyser." This consists of a metallic fork, the two prongs of which are connected with a suitable receiver such as a galvanometer or a telephone receiver. In the latter case an alternating current is passed between two electrodes, and the fork is used as an indicator of the lines of no potential difference. These are determined by gradually turning the analyser until the position of minimum sound is observed. The two prongs then give the direction of zero E.M.F., which is perpendicular to the line of current. When the electrodes do not reach the bottom of the containing vessel, the lines of current of necessity bulge out, and have the same effect as a shunt which naturally lowers the resistance perpendicular to the plates, consequently more current flows at the bottom part of the electrodes than at the top. This phenomenon is seen in a very striking manner in the case of dissolving electrodes, which, as is well known, disappear first towards the bottom. Another observation in connection with this point, is that in the case of the reversal of the negative plate, the brown colour always appears first at the bottom. These irregularities of C.D. due to the "shunt," are the chief causes of the buckling of plates. Thus the increased C.D. at the lower end of the electrodes causes an increased change in volume, and a consequent tendency to mechanical distortion. To investigate a storage battery electrode showing a non-homogeneous discharge on each side, the analyser consists of two small plates of spongy lead placed at equal distances on the opposite sides of the point of discharge, and coupled to a sensitive galvanometer. When a deflection occurs, the little plate on one side cuts more lines of current than the other, which is always the case in those cells composed of n positive and $n + 1$ negative plates. In these cases the C.D. is greatest on the side towards the end negative plate. The difference is greatest towards the end plates, which produces the largest amount of disintegration. There is a tendency for the discharge to become equal, and this causes a variation of the flow of the current at one and the same place. On a storage battery electrode which is non-homogeneously charged, local currents occur. Their existence and direction may easily be proved experimentally by means of a suitable analyser. It seems that lead peroxide plates behave far more regularly than those of spongy lead, both during charge and discharge.

NEW FITTINGS AND ACCESSORIES FOR ELECTRIC LIGHTING AND HEATING.

In the interests of the electrical trades and of that large body of our readers—installation contractors, station and consulting engineers, home suppliers and exporters—who have dealings in connection with them, we have for several weeks past been collecting a good deal of information concerning the preparations that have been made for the current season by our manufacturers and suppliers of fittings and appliances for electric lighting and heating.

We have reason for believing that our efforts in this direction in other years have been appreciated, not only by those whose work has thus been brought prominently before the notice of buyers, but by buyers themselves, and further, by those other sections of our readers who, though they never make direct purchases of a lamp or even a bit of flexible, can influence or decide the course of business, and for that and other reasons are interested in knowing what is being done by firms whose proper sphere it is to cater for the ever-changing tastes and requirements of the general user of electricity and electrical manufactures.

There never were such times as these for the compilation of trade catalogues, but valuable and essential as these publications are for many purposes—they fill a most important place—it would require more time than the average reader has to spare to run through anything like the whole of these for the purpose of finding out the latest developments. For such men the articles published in the following pages will do a good deal of what they would do for themselves, by selecting the outstanding features of current practice. Then, again, the Electrical Review finds its way into distant quarters of the globe where, we are gratified to know, it is studiously and—may we say it?—affectionately regarded by men of our own and other races, whose names are not on the catalogue address lists of our manufacturing firms.

In no sense can these notices be regarded as a duplication of the work of firms' own publicity departments, but we have no doubt that they will be the means of promoting inquiries which the publicity departments will, in due course, be required to follow up with trade literature and still more detailed information. We trust this issue will afford the necessary introduction between many buyers and sellers who are at present strangers to each other.

New Radiator Designs.

Messrs. Supplies, Ltd., of 9, Parr Street, Liverpool, have lately made their *debut* in electrical circles, their particular line of manufactures being electric radiators. Their telegraphic address,

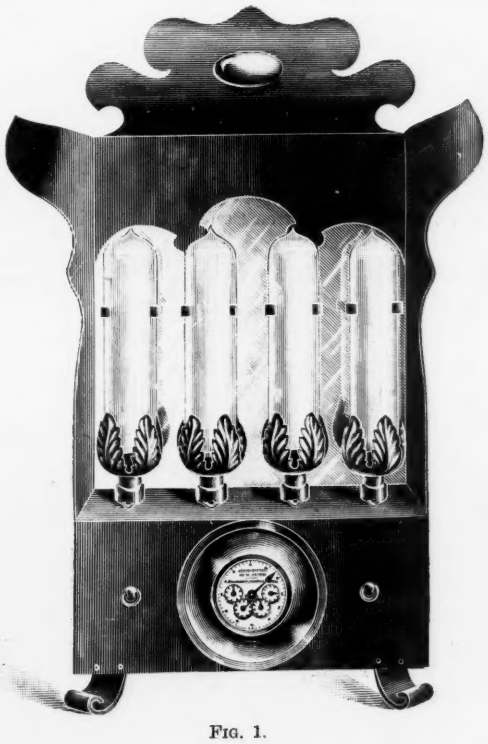


Fig. 1.

"Unopposed, Liverpool," may be regarded as indicating the confident spirit in which they have entered this now developing department of the industry. It is contended by them that with the lower charges which are now prevailing for electricity for heating purposes—sometimes as low as 1d. per unit—the cost compares favourably with that of other methods of artificial heating. Under the Supplies patents, meter rent charges are avoided, and the radiators may be moved from place to place with but slight expense for additional wiring.

The special feature of the radiators is the self-contained meter,

Fig. 2.

the cost of which is included in the price of each radiator. This meter enables consumers to attach the radiators to any electric supply main, provided that heat lamps are fitted for the correct

voltage of the circuit, and that the leads or connecting lines are of sufficient capacity to carry the current. Each radiator has two switches, by means of which either four lamps or two may be used, and the mechanism of the meter is so arranged that when two lamps only are used and the current consumption is thus reduced by one half, the same is clearly shown on the dial in front of each radiator.

The designs of radiators which are being offered by the company embody the result of many years' experience, and every care has been taken to combine electrical efficiency with ornamental appearance and strong construction. Special lampholders and switches are used in all the radiators. Many of the designs are fitted with a polished reflector, and a neat cover is provided with each radiator to enclose the meter, this cover being removable for the purpose of checking the meter readings. In fig. 1 we illustrate their No. 1,002 design, which is of black hammered iron with copper

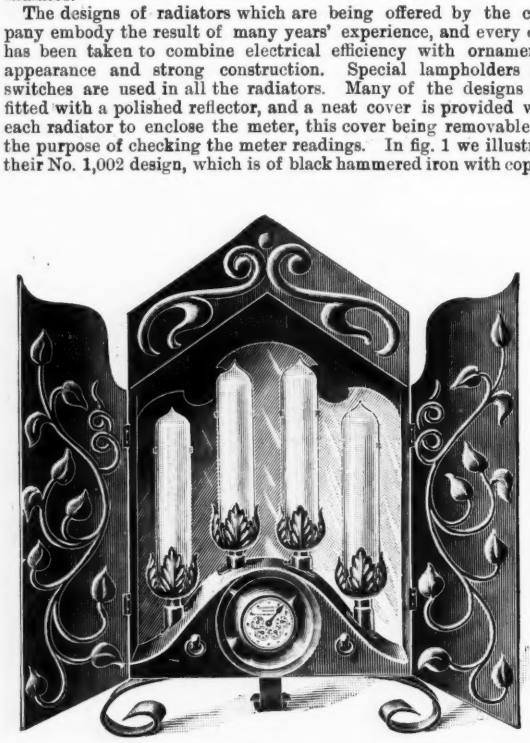


Fig. 3.

embellished leaf-shape lampholders; this radiator is fitted with a polished nickel silver reflector. Fig. 2 represents No. 1,006, which is an original conception in antique copper of floral design, with four lamps, two of which are visible in the illustration. The top lends itself either for decorative purposes or as a warming stand, according to whether the radiator is "on" or "off." Another original design in black hammered iron and bright copper floral embellishments is shown in fig. 3. The hinged flaps can be arranged at any angle, either to fit any position in which the radiator is situated or to concentrate heat and light in any particular direction. Many other original and pleasing designs are shown in the priced pamphlet recently issued by the company.

Ediswan New Fittings.

The Fittings showrooms of the Edison & Swan United Electric Light Co., Ltd., at 36 and 37, Queen Street, Cheapside, E.C., are, no doubt, a familiar resort for many electrical contractors, consulting engineers and architects. We have said so much on the occasions of our former visits that there is little new to tell except, of course, that a considerable alteration has naturally taken place

Fig. 4.—Ediswan Georgian Bracket in Polished Brass.

here, as at other fittings showrooms, as a result of the never-failing demand for new designs to fit in with new styles of furnishing, and to satisfy the ever-changing fancies of the public. The company has embodied a number of new things in the latest edition of Section VI of its fittings catalogue. This is a useful publication to the trade for noting prices and getting a general idea of the current designs, but it is not possible to pictorially produce upon the mind of the reader anything like the impression that an inspection of the actual fitting itself conveys. Therefore, whenever possible, clients should be taken to see things after they have been told about them or shown an illustration. A "Royal" Ediswan

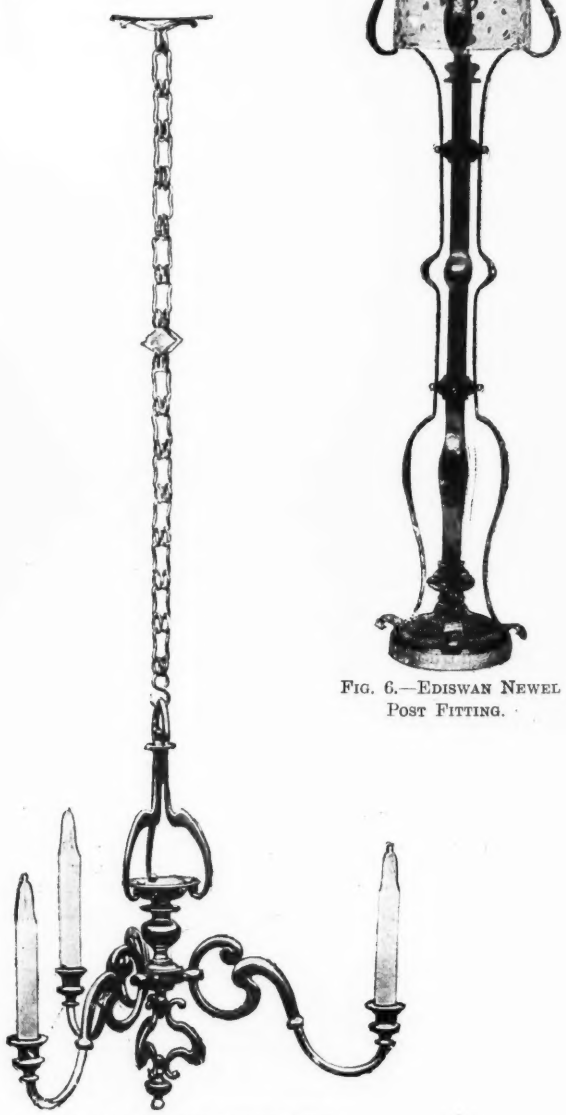


Fig. 5.—Ediswan Dutch Style.

Fig. 6.—Ediswan Newel Post Fitting.

Fig. 7.—Ediswan Bracket to Match Fig. 5.

Fig. 8.—Ediswan Antique Copper "Radiolite" Pendant.

reception awaits them. The new catalogue contains too many things in its 150 pages (art paper, about 9 in. × 11 in.) for us to mention a tithe of them, but first and foremost we observe a number of very effective new "Radiolite" pendant fittings. Another outstanding feature, too, is the use of the "Huntalite" candle lamps, which, in conjunction with various Dutch and Flemish designs, as well as with French style brackets, produce a charmingly artistic effect. Several pages are given up to fresh designs of ornamental telescopic floor standards in polished brass, hand-hammered, and cast and strip metal. There are innumerable excellent fancy brackets, which are supplied in polished brass, antique copper, or oxidised silver finishes; and many elegant designs in portable standards with a variety of fancy shades. In electrolier and bracket fittings, the Dutch, Flemish and Georgian styles are well represented. A new and cheap line in imitation bronzes is included; and there may also be selected for mention a number of dining-room pendants with cord-absorbing counterweight. Something out of the ordinary is also noticeable in the section which deals with portable standards and newel post fittings.

G.E.C. Fittings.

An hour spent in the elaborate electric fittings showrooms of the General Electric Co., Ltd., in Queen Victoria Street, E.C., examining the fine variety of artistic designs that have been prepared in readiness for the current season will well repay the

Fig. 9.—G.E.C. Dutch Style Electrolier.

visitor. Indeed, the *embarras de richesses* is such that the difficulty is to know what to dismiss when selecting prominent lines for notice in the Press.

We gather that the craze on the part of the purchaser for the *art nouveau* styles no longer prevails to anything like the same extent as formerly. The Dutch and Flemish styles are more in favour, while the Adams style is going as strong as ever; there is also a return to the classic French designs. A successful attempt has been made in these premises at classification by as far as possible devoting separate rooms to exhibiting fittings in particular styles. One department contains fittings of all kinds in Louis Seize and Empire styles, using "Shadoless" candle lamps; some fine examples of real bronze work are also on view here. Another room has candle brackets, electroliers, &c., to Louis XV patterns, and some further bronze specimens. A good deal of thought and care have been given to securing reproductions from the original fittings in the French palaces and official residences in Paris, with the result that for those who desire accuracy in the detail of their fittings there is produced some beautiful G.E.C. work without those shortcomings which sometimes accompany reputed correct copies. But the company also has on exhibition an assortment of simple fittings, which are specially offered to meet the free-wiring tendency of these times, when the "consumer in the cottage" and

Fig. 10.—A Cheap G.E.C. Line for Free Wiring.

his wants are being more closely studied by supply authorities. For such a consumer simplicity not devoid of neatness is of greater consequence than ornateness of design.

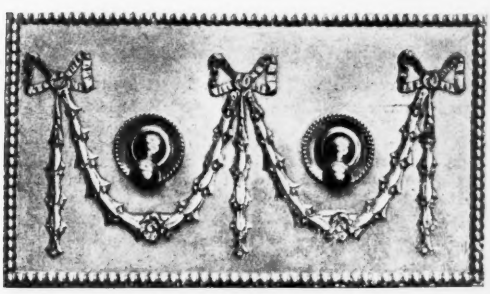


Fig. 11.—G.E.C. Art-Metal Switch Plate.

There is a well-appointed room in which we noted a collection of choice old Dutch models of candelabra fittings, which have been adapted for electric lighting by turning the arms downwards. By

Fig. 12.—G.E.C. Porcelain Standard.

the way, writing of Dutch styles, we understand that the G.E. Co.'s designs have recently been selected for this style of fittings for various suites of apartments at Hampton Court Palace. Other fittings contracts recently executed include those required for some four theatres, and for fine work required for the palatial residences of some of the Indian princes. In the crystal fittings room—there is still a considerable amount of revived interest in this style of

thing—there are also many attractive specimens of table standard and other fittings in porcelain ware. A few examples of wooden fittings, many excellent specimens of electric lantern fittings, some good lines in ornamental switch-plate work, a new cigar lighter, and new patent jointing device for wall fittings in house wiring work, are among the thousand things which pressed themselves upon our attention during the short hour in which we endeavoured to obtain an idea of what the G.E.C. had "going" for this season.

London Electrical Fittings.

Our representative was well repaid for his visit to the handsome showroom of the London Electrical Fittings Co., Ltd., at 7A, Soho Square, by what he saw, for the L.E.F. have not only an excellent collection of new and distinctive designs, but have also brought out some new and novel forms of pendants which will no doubt find favour with the trade, who are always on the look out for something really new. Amongst these latter may be noted in fig. 13 a Ball pendant for the "Ritelite" or other similar forms of lamp which has no other glass than that of the lamp itself, thus allowing the full lighting effect of the lamp, and at the same time giving it an artistic appearance.

Fig. 13.—A Neat L.E.F. Ball Pendant.

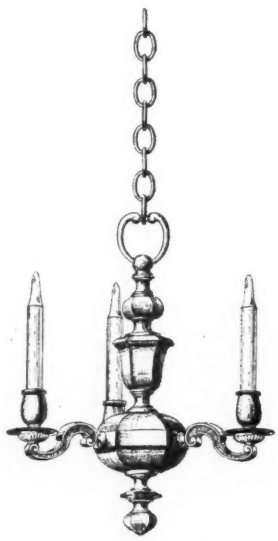
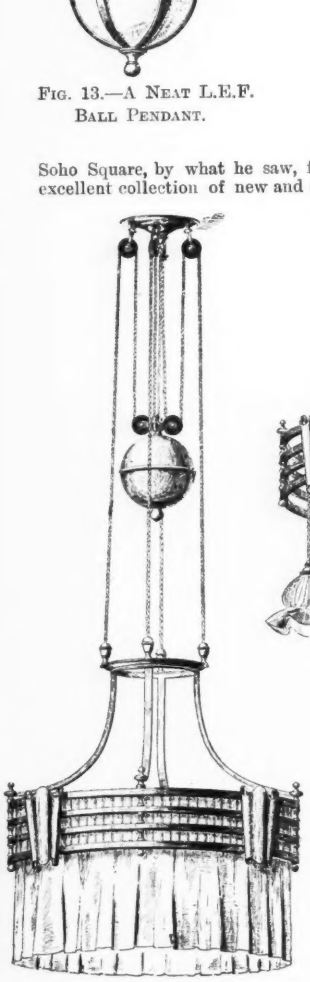


Fig. 14.—Georgian Candle Pendant.



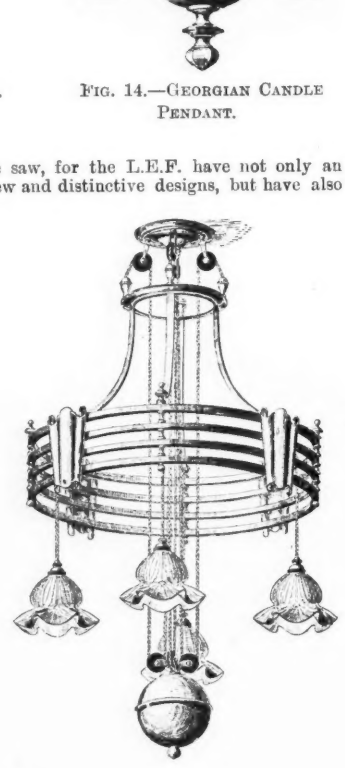


Fig. 16.

Fig. 15.—Adaptable Counterweight Corona in two Positions.

Figs. 15 and 16 show their No. 452 adaptable counterweight corona, which is made in such a manner that by removing four pins the valance may be easily and quickly removed, and the corona portion can then be pushed right up to the ceiling, forming a most effective ceiling light. There is no doubt that for dinner parties and other festive occasions such a fitting will be found extremely useful, the corona being removed well out of the way, thereby allowing for additional illumination by candelabra for the table itself. We show in fig. 14 a small three-light Georgian candle-pendant, which produced a very pretty effect.

We understand that, owing to the healthy state of their fittings business, the L.E.F. are shortly removing to larger showrooms; they would also like their friends to know that their new catalogue, arranged in the same handy form as the previous one, but considerably enlarged and brought up to date, will be published in November.

As regards accessories, the firm is now so closely allied to the Wandsworth Electrical Manufacturing Co., of Birmingham, that anything new in this direction is dealt with by the latter firm, who are specially equipped for such work. Their new switch is described on another page. All the London business of the Wandsworth Co. is dealt with by the L.E.F., and large stocks of their special lines are kept ready for immediate delivery at their factory, Roberts Works, Hampstead Road, N.W.

Messrs. Veritys' Manufactures.

Messrs. Veritys, Ltd., have many new things which they have recently placed upon the market, and several others of an interesting nature which will shortly be ready. In the early spring we published an article descriptive of Messrs. Veritys' works at Aston, where constructive ability and organisation march hand in hand. The firm are keeping well up to date, and we understand that their works have never been so full of orders.

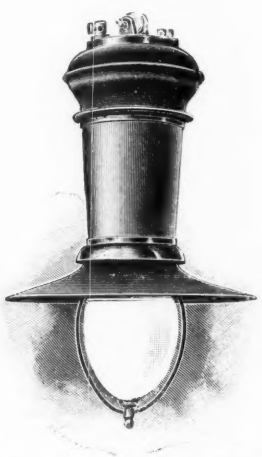


Fig. 17.—The "Monarc" Lamp.

All Messrs. Veritys' motors above 10 h.p. and dynamos of corresponding size are now fitted with interpoles, the advantage of sparkless running, in the makers' opinion, more than compensating for the slight extra cost of manufacture. Catalogue 520 deals with interpole motors, and No. 537 with interpole dynamos. The latter are turned out in three types, viz., motor type, dynamo type and engine type, having one bearing and half-coupling. Catalogue 532 contains full particulars of the engine type dynamo coupled to

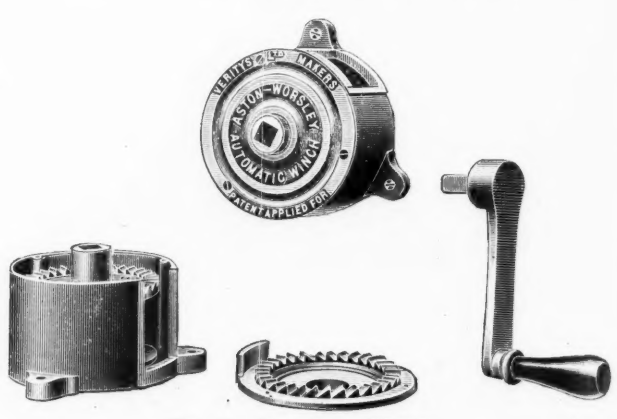


Fig. 18.—Self-Acting Winch.

a high-speed steam engine, and it should prove useful to contractors who are laying down small steam plants on shipboard or on land.

The "Monarc" lamp (fig. 17) which has recently been put upon the market is already quite a feature of the lighting season's trade. These lamps are a replica of the "Aston-Worsley" lamp but made two-thirds of full size. The single carbon lamp takes three amperes,

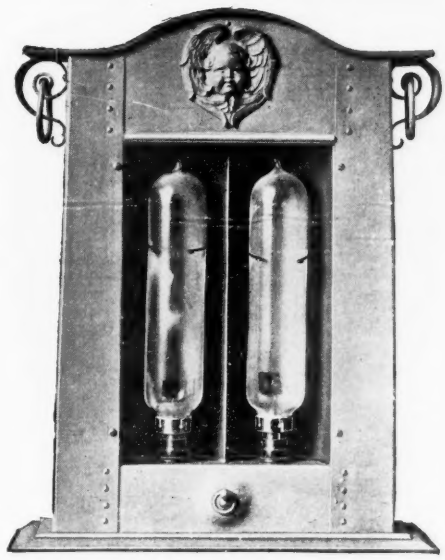


Fig. 19.—Verity Two-lamp Radiator.

and the twin lamp about half that amount; they burn from 60 to 100 hours, and are made for both direct and alternating current. We are informed that these lamps are proving exceedingly popular. The "Aston-Worsley" full-size lamp is already well known to our readers, and can be supplied to burn for 400 hours. The long burning is not obtained by a magazine, and there is nothing in the lamp likely to get out of order or give trouble. This lamp should become popular for street lighting, as it is claimed that one trimmer can do with it the work of four of ordinary type.

A flame lamp is also being put on the market this year, known as the "Flambo." These lamps are constructed for 8 and 16 hours' burning, and will burn five in series on 230 volts.

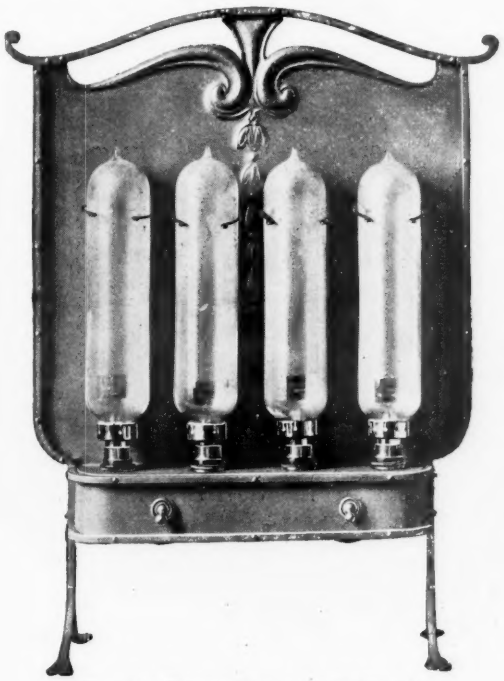


Fig. 20.—Verity Four-lamp Radiator.

The self-acting winch for arc lamps shown in fig. 18 fills a want often experienced; it is provided with a self-locking arrangement so arranged that when the handle is released the winch barrel locks itself and prevents the lamp from falling. In the "Aston-Worsley" self-locking winch this result is obtained in a very simple manner. When the handle is pressed inwards it comes into contact with th barrel containing the steel cord. The flange of this barrel has toothed face which meshes in with a corresponding face inside the front of the winch case. Pressure applied to the handle disengages the teeth and leaves the barrel free to be turned. The moment the handle is released the barrel flies back and the teeth

Fig. 21.—Verity's Electrolier in Gilt Finish.

mesh together, entirely preventing the barrel from turning. Circular 539 also contains particulars of the "Aston-Worsley" self-locking clutch and contact, which has already been described in these columns.

Messrs. Veritys are also making a speciality of shunt regulators of all sizes. These may be obtained (1) as combined motor

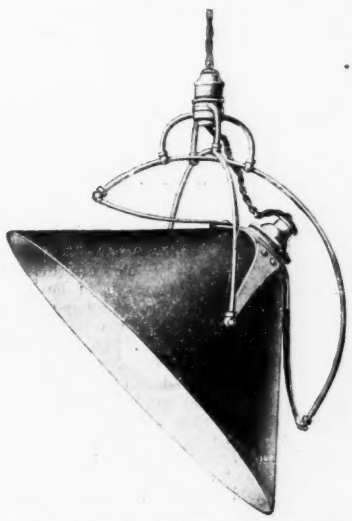


Fig. 22.—The "Everyway" Tilter.

starters and field regulators having an exceptionally long range of regulation; (2) as shunt regulators only. In the latter case the shunt regulator is provided with a double arm, and is so designed that it can be interlocked electrically with an ordinary starting switch, so that the motor under control cannot be started except with all resistance cut out from the shunt windings.

The radiator season is being well catered for by Messrs. Veritys, who have issued a very complete catalogue, No. 538, of their

"Aston" radiators. This embraces many new designs, and we understand that considerable improvements have been made in the construction of all the radiators for this year's market. We illustrate two of the "Aston" radiators, fig. 19 showing a neat design of a two-lamp radiator in brass and copper, and fig. 20 a four-lamp radiator in antique brass and bright iron.

Many new designs of art fittings are being put upon the market, and these appear thoroughly in keeping with the new movement that undoubtedly is being felt, calling for more artistic and tasteful treatment of interior decorations. Publication 534 contains some very neat designs of three and five-light electroliers, brackets, standards and pendants. Fig. 21 shows a three-light electrolier in gilt finish.

A further catalogue is, we understand, in preparation, containing 32 pages and devoted entirely to better class fittings suitable for public buildings and residences. This will be ready for issue next month.

Another catalogue, No. 540, is devoted to a very neat solution of the problem of tilting shades to any angle. The device is known as the "Everyway" Tilter (Patent), and fig. 22 shows how the result is achieved. Most tilters are only applicable to pendant lights, but this one can also be fitted to brackets, electroliers, and standards and it is claimed that there is nothing in it to get out of order.

Hawkes Fittings.

The extensive works of Messrs. O. C. Hawkes, Ltd., of Bromsgrove Street, Birmingham (and 69 and 70, Aldersgate Street, E.C.), where over a thousand hands are employed, enables the firm to cover a wide range of manufactures. Besides metal fittings, principally hand-hammered and of original design, a new line of fittings made of combinations of wood, metal and glass has been introduced, of which an example is shown in fig. 24; this is white enamelled, with cast-brass husks and inset silk panels, with etched glass shades to match.

The XL patent induced draught system of electric heating, introduced by Messrs. Hawkes, does not aim at the utilisation of

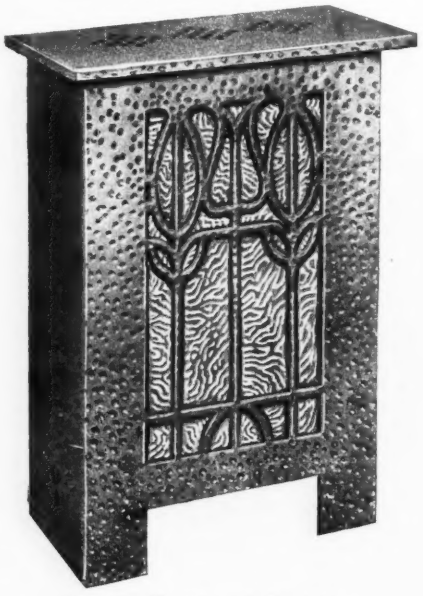


Fig. 23.—Hawkes XL Radiator.

radiant heat. All the energy is intercepted in the stove and employed solely in raising the temperature of the air passed through it. By this system the greatest possible current density is utilised in the conductors without the disadvantages of buried wires. The powerful induced draught carries the heat away as it is generated, and the respective quantities of current and draught are regulated so as to ensure the highest possible efficiency. While a certain amount of electrical energy must necessarily give a fixed amount of heat, Messrs. Hawkes contend that this statement, although essentially true, ignores all considerations of temperature and the rate of dissipation of the heat when generated, although these are most important factors in the calculations of the heating expert. The only test of a stove's efficiency lies in the rapidity with which it will raise the temperature of a room, and it is claimed that these stoves "XL" all others in this respect. One of their new designs is illustrated above.

The Crystalline Glass Patent is a new process of Messrs. Hawkes for lettering on glass, in which a wide range of delicate tints is obtainable; the lettering is crystalline in character, as the name implies. The effect of these letters, when illuminated by the electric light, is said to be novel and charming in the highest degree, and to form a tasteful and effective advertising medium. It possesses the additional advantage of being comparatively inexpensive. The firm is also specialising in the sale of a 4-in.-bulb lamp with opalescent reflector of a type similar to those which have been put on the market of late by the leading lamp manufacturers. For it are claimed a very high efficiency and long life, combined with excellent downward diffusion of light, which make it specially suitable for shop lighting, and for the illumination of churches and

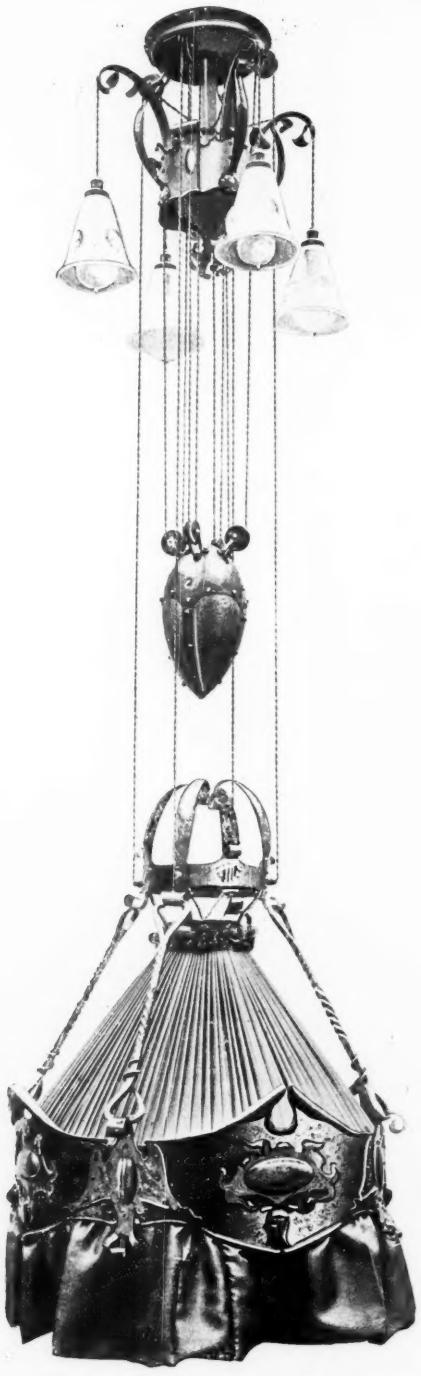


Fig. 24.—Hawkes Pendant Fitting.

public buildings. The firm will shortly issue new catalogues containing a great number of new designs in the foregoing and other lines.

Fuses.

The British Electric Calibrated Fuse Co., of 14, Golden Lane, London, E.C., specialise in fuses only. Their works at Harpenden, Herts, have just been extended by the addition of a new shop, to cope with the growing demand. Their chief speciality is "Pyrotin Fuse Wire" of which they are sole makers. This wire is cheaper than and superior to tin. They also supply this wire in a very handy form, each 1-lb. reel being encased in a neat metal box, making it handy for the wireman to carry in his bag. They supply strip of the same material to fuse over 50 amperes; they also make every kind of enclosed fuse—Mordey patents—and their sale of these is rapidly increasing, thereby proving their reliability and accuracy. These fuses are "quite English you know," being entirely made at the company's own works. In a 16 pp. well illustrated catalogue these various types of fuses are shown and described, sizes and prices being set out in tabular form.

Evered's Fittings.

Since we last had an opportunity of visiting the showrooms of Messrs. Evered & Co., Ltd., in Drury Lane, W.C., many new and excellent examples of electric light fittings, manufactured at the

Fig. 25.—An Evered Bracket Design.

firm's works at Birmingham, have been placed on view to meet the ever-changing demand. The Adams style of fittings and antique copper and brass finishes are most in favour at present. Throughout the various departments of these large showrooms we noted a

Fig. 26.—A New Evered Electrolier.

great assortment of electrolier fittings and some light and pleasing specimens of two-light pendants for bedroom and other service; lanterns, brackets and standards are also exhibited which reflect great credit upon the artistic capabilities of the designing staff, and also as regards finish, upon the works. We have selected for illustration

Fig. 27.—An Evered Lantern Fitting.

three examples of bracket, pendant and electrolier fittings, and these may be regarded as representative of Messrs. Evered's more recent designs which are now on the market.

Linolite Picture Fitting.

One of the special and most successful applications of the system of the Linolite Co., of 25, Victoria Street, S.W., is to the lighting of pictures, which only too often are robbed of their artistic amenities by the use of crude and garish methods of illumination. It is essential that the source of light be screened from the eye of the observer, and that the light be evenly distributed, to avoid harsh reflections, and these requirements are admirably fulfilled by the Linolite system, with the special picture section, of which the latest pattern is illustrated herewith. The effect of this device is

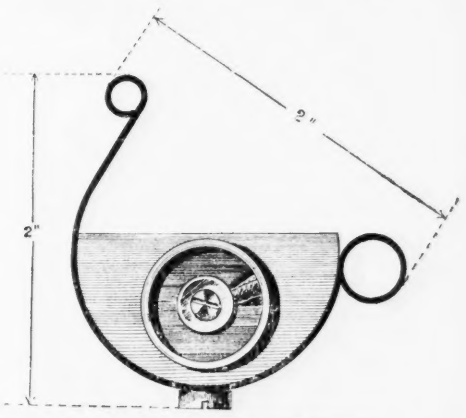


Fig. 28.—Linolite Picture Section.

surprising to those who have been accustomed only to the primitive and unscientific arrangements commonly employed. We have on previous occasions explained how, by Linolite reflected from the ceiling, the interiors of rooms can be illuminated with the most pleasing effects, and with economy of energy, and how the material lends itself to the lighting of shop windows. The modern illuminating engineer cannot afford to ignore the scientific methods which have been devised for his assistance.

Falk, Stadelmann's Fittings.

A visit to the well equipped showrooms of Messrs. Falk, Stadelmann & Co., Ltd., is always interesting by reason of the diversity and beauty of the objects displayed. The company make a point of exhibiting special pieces of more elaborate character than the designs embraced in their catalogue, and amongst these

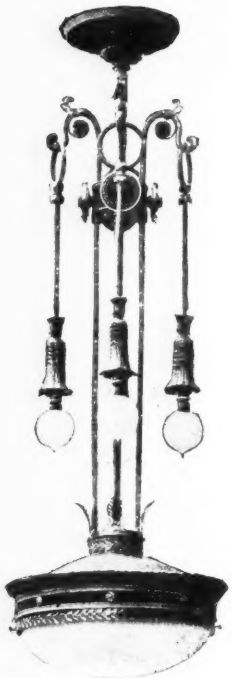


Fig. 29.—An Example of the "Empire" School.

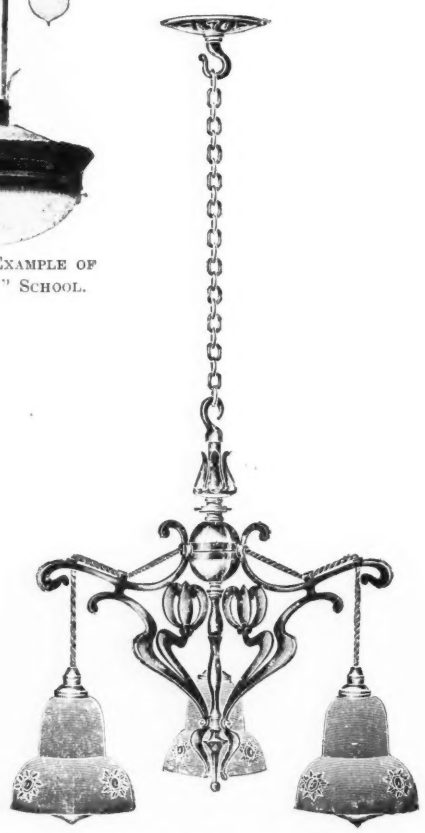


Fig. 30.—A Typical "Commercial" Fitting.

are some choice fixtures, of which, in fig. 29, is illustrated an example in the Empire school. This is a finely executed piece of work, in chased cast brass, the finish being a combination of old brass and dark green bronze. Several massive and important-looking cut crystal suspensions are on view, suitable for large drawing-rooms, &c. Additions are also made, at frequent intervals, of new designs to their stock patterns, and of these Messrs. Falk, Stadelmann & Co., Ltd., issue printed slips. Such fittings, while essentially commercial in price, are withal in good style, that illustrated by fig. 30 being typical. Statuary still claims close attention, and ranges over models in faience and real and compo. bronze, in the form of table decorations, newels, &c., to suspension cupids and seraphs for more practical lighting.

A new fittings catalogue is in course of compilation, but it is too early to make any statement as to the date of publication.

To leave the artistic for the technical side of the business, mention may be made of the Aureola luminous radiators, of which some new designs for the coming season are being introduced; of the Climax system of steel interior conduits; and of the Climax electric light cables, which are of English manufacture.

Simplex Fittings.

New devices come in a steady stream from the Simplex Conduits, Ltd., of Garrison Lane, Birmingham. Some of the latest are illustrated herewith. Simplex watertight bulk-head fittings (fig. 31) for mill, factory or ship lighting are supplied in two qualities. The cheaper quality is supplied either with a painted or pot enamelled reflector, while the best quality has a hinged glass cover which is fastened by means of a lock and key, and is supplied pot enamelled only.

Simplex conduit racks (fig. 32) are specially suitable for the heavier types of conduits in the larger sizes, such as 1¼ to 2 in. diameter. They also possess the advantage of keeping the conduits

Fig. 31.—Simplex Watertight Bulkhead Fitting.

Fig. 32.—Simplex Conduit Rack.

from direct contact with the walls, which is a desirable feature when moisture is present, and they facilitate alterations and extensions.

The wall fasteners, shown in fig. 33, are handy little accessories which have been found to assist greatly in fixing conduits and the various types of connection boxes on brick, cement-faced and fire-proof walls. They are made of best hardened steel, and are supplied in two sizes, viz., 1⅜ and 2 in. long. One end of the fastener is pointed, so that it may be driven into the wall, and the other end has a tapped hole to receive a ½-in. brass screw. The illustration shows the method of fixing a conduit saddle by means of two of these fasteners.

The D.P. interior, shown in the illustration, fig. 34, is specially designed to fit the large sizes of rectangular junction boxes, and is for use in making branch connections from cables carrying currents up to 250 amperes. The base is of slate, with a fibre division

Fig. 33.—Patent Wall-Fastener.

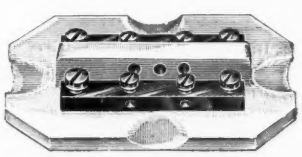


Fig. 34.—Simplex D.P. Interior.

fillet in the centre, on either side of which are two copper bus-bars of ample sectional area. Sweating sockets are fixed at each end, so that the whole length of the bus-bar is available for tapping off any number of branch circuits as required.

"Crystalate" Insulating Material.

The Crystalate Manufacturing Co., Ltd., of Tonbridge, Kent, have made several additions to their comprehensive catalogue of insulating fittings. They manufacture at their extensive works the steel moulds requisite for moulding the "Crystalate" fittings, and are, therefore, able to deal accurately and promptly with any demands for specially shaped parts required by their customers. Many fittings made by electrical engineers are sent to the Crystalate Co. for them to mould their insulating material round the metal parts themselves.

Independent tests carried out by the Electrical Standardising, Testing and Training Institution show that "Crystalate" possesses very high insulation resistance. It is also non-absorbent and mechanically strong, and the fittings which we have seen are perfect in shape, with a highly polished surface. It can be produced in various colours, and differs from some other compositions in that the colour is the same throughout the section.

The rapidly increasing business which the Crystalate Co. are doing with most of the leading electrical firms in switch handles, bushes, washers, tube ends, and the innumerable insulating parts required in lighting, power, and telegraphic and telephonic work, proves that the claims made on behalf of "Crystalate" are borne out by the experience of its users.

Service and Distributing Boxes.

The enormous number of these fittings annually called for has had the usual result of stimulating invention and hastening the evolution of patterns which shall to the utmost satisfy the demand for convenience, efficiency and cheapness. An excellent series of such designs has emanated from the works of Messrs. A. Reyrolle & Co., Ltd., of Hebburn-on-Tyne, of which a few examples

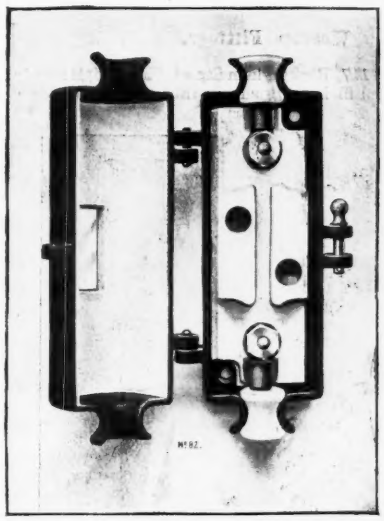


Fig. 35.—House Service Fuse Box.

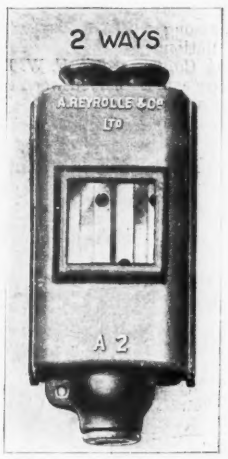


Fig. 36.—Two-way Box.

are illustrated herewith. Fig. 35 shows a house service fuse-box with a hinged lid, provided with an inspection window. The interior is of porcelain, with sweating thimbles for the conductors, which enter through porcelain insulators. The fuse shown is suitable for currents up to 50 amperes at 250 volts, and, mounted in pairs on a board with a cable-end sealing box, has been largely employed by the Newcastle Electric Supply Co.

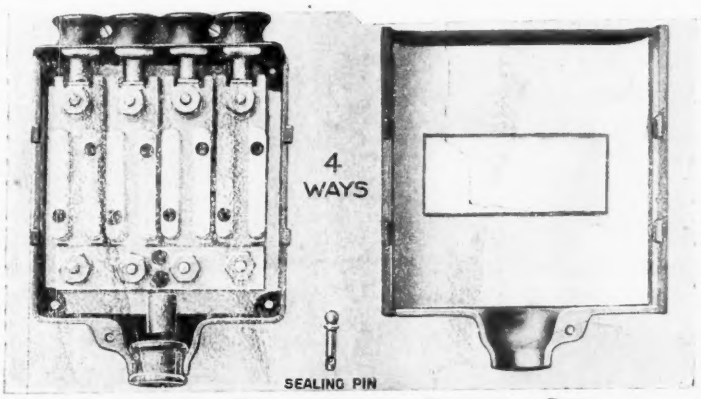


Fig. 37.—Reyolle Four-way Iron-clad Distributing Box.

Figs. 36 and 37 show the exterior and interior of multiple-way fireproof iron-clad distributing boxes. These are generally similar in design to the former, but have detachable covers, which are locked in place by the sealing pin. Each way can carry up to 50 amperes at 100 volts, or 25 amperes at 250 volts, and the type is made for from 1 to 6 ways. The fuses are of stamped copper strip and are stamped with the rated current capacity. The interior of the cover is lined with asbestos. These boxes are suitable for workshops, ships, shipyards, &c., as well as for house installations, and combine high insulation with accessibility and protection from moisture, fire, &c.

Tantalum Lamps.

In the accompanying figure (No. 38) we show the Tantalum lamp with spherical globe, which is being supplied for 100-130 volts only by Messrs. Siemens Bros.' Dynamo Works, Ltd. Although with the Tantalum lamp the light may be deflected downwards by shades or reflectors in the usual way, we understand that the results obtained by using "Holophane" shades and bulbs having the pip-end obscured are the best. It is stated that this form of obscuring increases the downward illumination by more than 100 per cent. without reducing the horizontal illumination, and it has been adopted as the standard instead of clear glass lamps. In the firm's new price sheet No. 15F which is just being issued, we note that the lamps are now being offered for several new voltages (80, 125 and 130 volts). A number of adapters, wired for burning lamps two and three in series, are illustrated, and the now well-known "Tantalum Sun" lamp is also included, together with a list of its prices.

Messrs. Siemens have prepared an exceedingly attractive booklet relating to these lamps for the purpose of circulation among consumers. A brief description of the lamp leads the way, then follows a list of the advantages claimed for it over the ordinary glow and other forms of lamp, and a statement in which the saving

Fig. 38.—Tantalum Lamp with Spherical Globe.

to be effected in energy consumption is set out for the consumer's education. Some interesting reproductions from photographs show the Victoria Hall and certain rooms at the Hotel Cecil, also the luncheon and tea rooms at Messrs. Wm. Whiteley's, as well as various buildings in the provinces, where Tantalum lamps are employed.

An Improved Ladder.

For several years it has been in the mind of Mr. Heathman, the ladder maker of Parson's Green, that improvement was needed to enable an arc lamp trimmer's ladder to be easily adjusted at any angle

Fig. 39.—Heathman's Improved Ladder.

of inclination towards a lamp column, or to lie flat down upon its truck so as to be wheeled under arches and into low store rooms to be warehoused in the dry under cover, and now he has accomplished his object with such a result that the man has only to turn a hand-wheel at the side of the truck shafts. The illustration (fig. 39) shows one of treble section extending to 35 ft., which has recently been on view at the Engineering Exhibition, Olympia, Stand 242A.

I.T.E. Circuit Breakers.

The I.T.E. Electric Co., of 20, Great Russell Street, London, E.C., have lately issued a new catalogue in which they deal very exhaustively, and with the aid of innumerable diagrammatic and general illustrations, with the many forms that have been developed of this circuit breaker. We are asked to let the trade know that this publication cancels all previous catalogues relating to the I.T.E. breakers, this company (with Mr. W. Everett Gibson as manager) being the sole representatives for them in the United Kingdom. The company, we learn, have in their stores in London over 500 circuit breakers of different capacities and suitable for plain overhead work, these instruments constituting the stock of the Western Electric Co., of Chicago, and they are being offered at very low prices. In addition to the catalogue (strongly bound 8 in. × 11 in., 196 pp., art paper, with convenient thumb index to sections concerning different types) we have also received a list of the quantities of the various sizes which we have already referred to as being held in stock in London.

Theatre Illumination Battens and Stage Arc Lamps.

Messrs. Cecil Hodges & Co., of Balfour House, Finsbury Pavement, whose works are situate at Millwall, are manufacturing several interesting lines connected with theatre installation work to which the attention of consulting engineers and contractors may be directed. Their patent screened-light batten has been accorded a good reception from those responsible for the installations recently put in at a number of theatres, including the Tivoli, Oxford, Cardiff, and the new theatre now erecting at East Ham, but special mention should be made of the installation for His Majesty's Theatre at Aberdeen. In our issue of September 28th we mentioned, among our "Contracts Closed," that the contract for the entire installation had been placed with the Aberdeen Electrical Engineering Co., Ltd., at £3,994, and Messrs. Hodges are supplying this patent batten for the footlights, floats, &c., and 14 of their electric searchlight projectors for stage purposes—to a value of about £600—these lines having been expressly specified by Messrs. Owen Lucas and Pyke, the consulting engineers for the work. It may be interesting to our readers to know that this batten was specially designed by Messrs. Hodges to meet the requirements of Mr. Tree at His Majesty's Theatre, London, to produce certain desired effects,

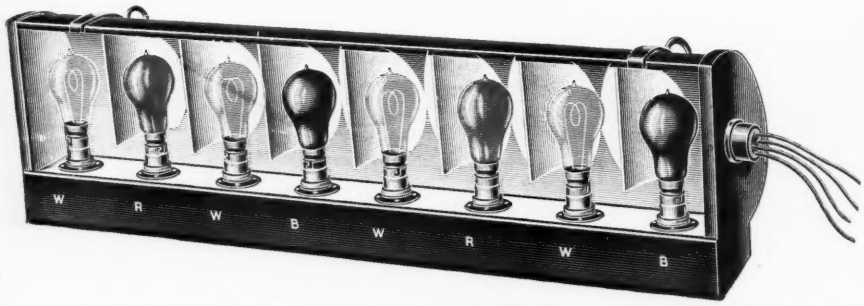


Fig. 40.—Hodges Patent "Screened-Light" Batten.

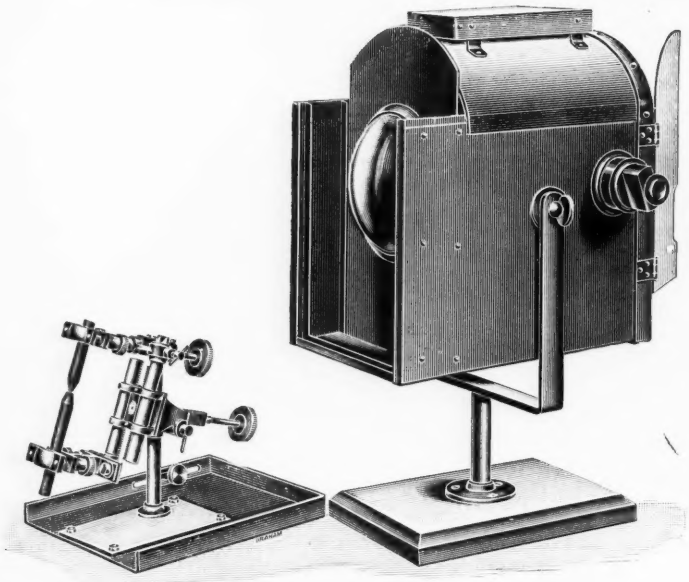


Fig. 41.—The Searchlight Stage Arc Lamp.

and Mr. Tree had the entire theatre fitted up with it. In the firm's circulars the principle is clearly shown by an illustration in colours, but the idea can be conveyed sufficiently plainly for our readers' information by means of the accompanying illustration, fig. 40. It will be seen that the arrangement of the reflectors is such that the mingling of lights of different colours is prevented; for instance, if a white light be required, the white light does not shine through the adjacent unlit coloured lamps. When the colours are required to mingle, the necessary switches are turned on. This batten is claimed to have a very large reflecting surface, and to take up less room between the cloths than other battens. Wire guards are dispensed with, as, owing to the particular shape of the ironwork, it protects the lamps if the scenery strikes the battens, and no damage is done; it therefore takes less time to remove defective lamps and fix new ones. The long iron case is stayed together by means of special reflectors, which are fixed to the ironwork continuously every 4 in. or so, and a strong, though light fitting results. No woodwork or other combustible material is used in the construction unless required, and the wires are enclosed in metallic casings.

In fig. 41 we illustrate the firm's "Searchlight" stage arc lamp, such as they are putting in at Aberdeen. We understand that this lamp will carry up to 60 amperes without undue heating, and is adjustable in every way. The carbon holders will take carbons up to 25 millimetres in diameter, and they are arranged so that the lamp can be retrimmed at once, without waiting for it to cool. There is ample ventilation.

The gear for feeding the carbons has been very carefully designed, and embodies improved arrangements which prevent it from jamming when the lamp is hot.

The lamp is supplied complete in a sheet-iron case, lined with asbestos, and fitted with a 7-in. convex lens and three coloured slides, with removable front, for either giving focusing or flooding light, with wall socket, plug and spy hole.

Wooden Fittings.

Mr. F. W. Dover, 117, Rockingham Street, Sheffield, is supplying carved wood electrical fittings which are said to be becoming very

Fig. 42.—Dover Wooden Candlestick Fitting

Fig. 43.—Three-light Bracket Fitting.

popular because they are both artistic and warm-looking. They do not tarnish or in any way spoil with use, and they also harmonise very well with the present style of furniture. Fig. 43 shows a 3-light bracket fitting (No. 1,030), and in fig. 42 is illustrated a small wooden candlestick fitting. These and Mr. Dover's other designs can be made in any suitable wood such as walnut, mahogany, oak, &c. Lists can be had on application to the firm.

Electric Light Shades.

Mr. John Walsh Walsh, of the Soho and Vesta Glass Works, Birmingham, has for very many years been connected with the electric lighting industry as a designer and manufacturer of artistic glass shades for electric lamps. A variety of his latest designs are shown on a new sheet which has just been issued. The firm's London office and showroom are situated at 4, Holborn Circus, E C.

J. & P. Arc Lamps.

In their "H" price list of electric arc lamps, Messrs. Johnson and Phillips, Ltd., of Charlton, give illustrated particulars of their Juno flame lamp, their J. & P. open type arc lamps, and the single and double enclosed "Ark" lamp, which are already familiar to Electrical Review readers.

Iron-clad Distribution Box, and Switchgear.

Messrs. Ward & Goldstone, of Dutton Street, Strangeways, Manchester, have introduced a distribution fuseboard in a strong cast-iron case, as shown in fig. 44, with a glazed door, and of neat appearance. The metal conducting parts are very substantial, and the inside of the box can be lined, if desired, with the firm's patent "Vitro" enamelled lining, which ensures high insulation. A

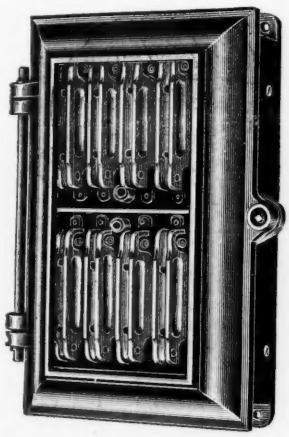


Fig. 44.—Iron-clad Distribution Box.

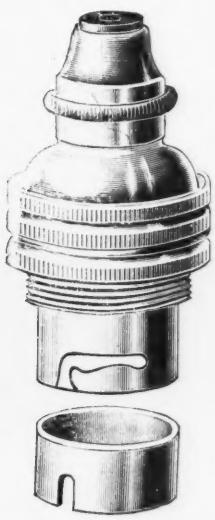


Fig. 45.—The "Off and On" Switch Lampholder.

variety of other switch fuseboards is made, together with switches and other accessories, including wall plugs, lampholders, watertight fittings, &c. We illustrate in fig. 46 the "Knowle" D.P. switch, which has a quick parallel break and large contact surface; and fig. 45 shows the "off and on" switch lampholder, in which the current is switched off and on by rotating the lamp. The movement causes a double break, the contacts sliding away simultaneously; the lamp cannot be removed whilst alight, and the locking collar which is shown in the figure secures the lamp in the holder. The arrangement is exceedingly simple, besides being neat and easy to wire.

Fig. 46.—The "Knowle" D.P. Switch.

Owing to the increase in their business, both in accessories and in wires and cables, the firm have just built a new works, twice the size of the old one, driven by producer gas. Thus the output will be more than doubled, and there will be no delay through the removal, the new machinery being at work before the old machines are transferred; and the improved conditions of manufacture will enable the firm to turn out their products with greater economy and dispatch. They have issued a new supplemental price list detailing their latest patterns, and a leaflet particularising a number of accessories.

A New Portable Testing Set.

The accompanying figure shows a portable direct-current testing set, recently put on the market by Messrs. Everett, Edgcumbe and Co., Ltd., of Collindale Works, Hendon, who claim for it that it is the lightest and most compact set so far produced; it weighs, in fact, 10 lb. complete, and measures only 8 in. × 7 in. × 5¼ in. It consists of one of their standard moving-coil movements, provided with shunts for 3, 30 and 300 amperes, and having voltmeter ranges of 15, 150, 300 and 600 volts. The scale is divided into 150 parts, and the divisions are perfectly even throughout, so that accurate readings can be taken right down to the bottom of the scale.

A special feature is the ease with which the change is made from current to voltage, and *vice versâ*. Two insulated press buttons will be noticed to the left of the dial, which can be depressed in rapid succession, the one being marked "Amperes" and the other "Volts." This arrangement has two important advantages. In the first place, the change from current to voltage can be made so rapidly that the two quantities may be measured almost simultaneously; and secondly, all live parts are absolutely enclosed, so that it is impossible to get a shock during the operation of changing over, as frequently happens with the usual form of exposed switch.

The shunts are all removable from the case, and long connecting leads are supplied so that the instrument itself can be placed wherever it can be most conveniently read. The connecting leads

Fig. 47.—Everett-Edgcumbe Portable Testing Set.

terminate in plugs, so that connection is instantly made with the shunts, and, at the same time, the internal resistance of the instrument is so high that no error is likely to be introduced by bad contacts. The movement is, moreover, completely shielded from disturbance by stray magnetic fields.

Besides current and voltage measurements from one-thousandth of an ampere or volt, as the case may be, resistance and insulation tests from one ten-thousandth of an ohm to 5 megohms can be readily made. In fact, the instrument may be said to form a complete portable test room so far as direct-current measurements are concerned. For alternating-current work, Messrs. Everett, Edgcumbe & Co., Ltd., have another very compact set available.

Walsall Switchgear, &c.

The Walsall Electrical Co., Ltd., of 57, Bridge Street, Walsall, has given its attention more particularly to the manufacture of switchgear of all classes, and the firm is receiving repeat orders for switchboards, instruments, and especially for its "Unique" switch. The company can give deliveries from stock for all sizes of iron-clad switches from 25 to 100 amperes, and can supply larger

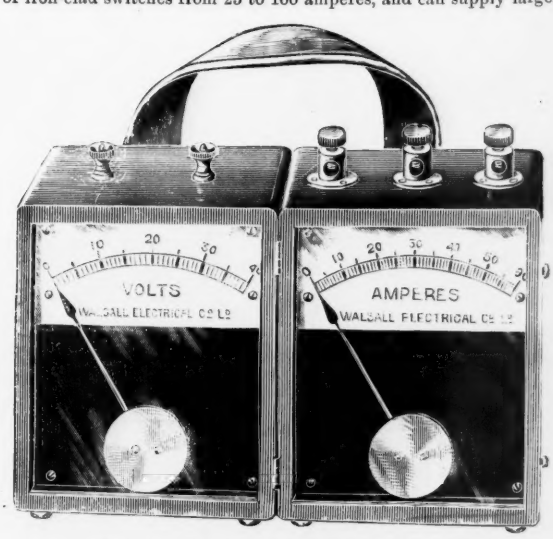


Fig. 48.—Walsall "Railroad" Meter.

sizes at short notice. We understand also that it is doing a big business in power transmission switchboards, and in meter work. We give above an illustration of the firm's "Railroad" meter, which consists of an ammeter and voltmeter of the moving-coil type, in massive teak cases hinged together and having a leather carrying handle so arranged that the glasses of the meters are together when the instrument is carried by the strap. These meters have been adopted by the leading railway companies for testing purposes on train lighting, and can be supplied with one or two readings as the ammeter illustrated.

The "Conrex" Bender.

Messrs. Conduits & Fittings, Ltd., of Salusbury Road, Kilburn, N.W., are supplying this bender for the use of electrical wiring contractors and a good many other trades, who require a simple tool for bending tubes and light rods and bars of iron (hot or cold) quickly and with unskilled labour. It is claimed to bend or straighten tubes of all kinds without flattening or kinking. Tubes may be bent to any radius. The procedure is as follows:—The tube is placed in position in the correct groove, and is drawn slightly toward the user, then passed a very short distance further

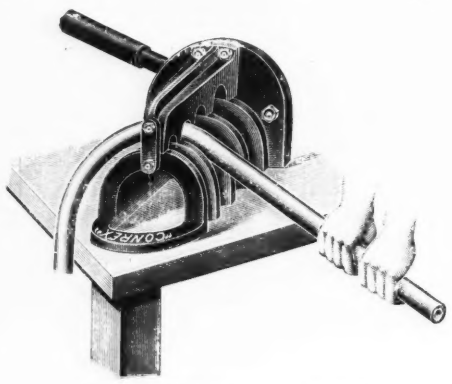


Fig. 49.—The "Conrex" Bender.

through the dies, and then drawn toward the user again. Where possible it is preferable to have the bender fastened down to the bench, but if required to be moved about it can be laid on its back, when a second operator can steady the tool by means of the lever provided, with a short length of tube slipped over the end.

An Electrical Balance.

Messrs. W. & T. Avery, Ltd., showed at the Royal Cornwall Polytechnic Exhibition a small electrically-operated automatic weigher, invented by Mr. A. F. H. Stephens, of Camborne.

It is designed to meet the demand for an automatic weighing machine for materials of a non-free-running nature, which, previously, it has not been found feasible to weigh in small quantities.

It is suitable for almost every kind of material which has to be weighed and packeted in amounts ranging from 1 to 14 lb., and in

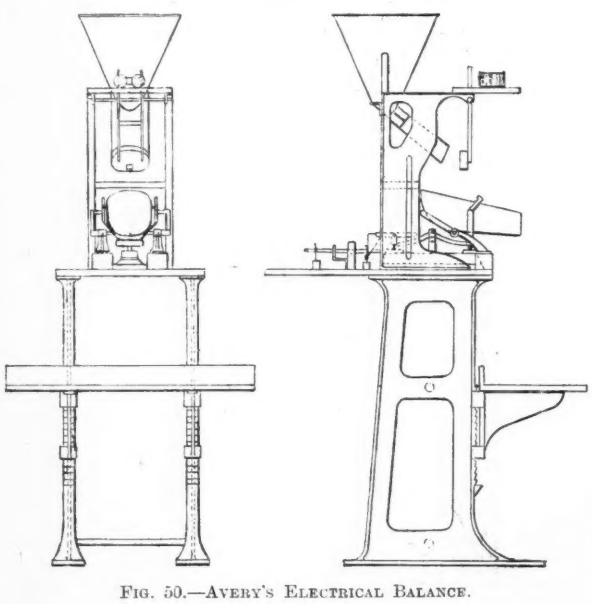


Fig. 50.—Avery's Electrical Balance.

order to deal with this range it is made in three sizes, viz., to weigh from 8 oz. to 2 lb.; from 1 lb. to 3-4 lb.; and from 7 to 14 lb.

The material is fed to a hopper, and falls through a shoot into the scale-pan. This shoot is vibrated continuously by an electro-magnet, excited from a small battery attached to the scale, and a regular flow is obtained without choking. At the moment of balance the action of the beam breaks the magnet circuit, and at the same time the gate of the shoot closing shuts off the supply of material.

This weigher gained the highest award given at the Exhibition, and, we understand, is already in great demand.

Roller Switch and Lamp Tester.

Messrs. Krupka & Jacoby, of Watling Street, E.C., are supplying a new patent roller tumbler switch for high voltage circuits. It has a fluted brass cover and loop-in holes. It is claimed to have a simple, smooth and prompt action, and to be very highly insulated, and practically impervious to moisture. The

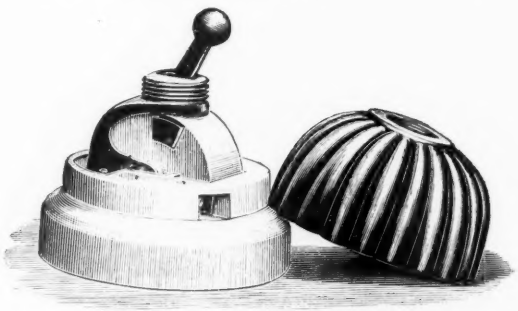


Fig. 51.—Patent Roller Switch.

acting parts are all separated from each other; the handle and cover, &c., are said to be so perfectly insulated from all live parts that lined metal, or china covers, are unnecessary. Any alterations, adjustments and repairs can be effected without removing the switch from the block. We illustrate in fig. 51 a single pole example of the switch. In fig. 52 we show another of the firm's many special lines, namely, a small wattmeter for alternating or direct current for testing incandescent lamps. The tester enables the user to read direct the amount of power consumed in watts by lamps up to

Fig. 52.—Lamp-testing Wattmeter

32 c.p on 250 volts; it weighs 1½ lb., and is supplied with a nickel-plated finish. Another of Messrs. Krupka & Jacoby's current features is the Biliotti patent time element thermal cut-out, which has already been fully described in the Electrical Review.

Messrs. Drake & Gorham, Ltd.

We recently spent a short time on a visit to Messrs. Drake and Gorham's premises in Victoria Street, part of which has long been laid out for the exhibition of their fittings, arc and other lamps, country house installation plant, and so on. In the department which is specially devoted to their various types of arc lamps, will be found examples of the Jandus flame lamp, of which we give a drawing (fig. 53). This lamp dispenses with complicated mechanism; the carbons drop by gravity, and are supported by incombustible stops. There are no shunt coils, and cut-outs and substitutional resistances are not required on circuits up to 250 volts. For street and shop lighting, these lamps are specially adapted. The Jandus photographic arc lamp which has already been described in our pages is in evidence; it is a very compact lamp, and gives a well distributed light, being fitted with patent reflectors inside the globe, which ensures a good even light over the whole of a negative. The lamp can be arranged to fit any standard enlarging apparatus. The company's circular relating to these lamps gives prices for both continuous and alternating current use for standard pressures of from 100 to 250 volts. The inverted lamp for drawing office use was also seen; it has an opal glass reflector, and is supplied in either a short pattern (2 ft. 2 in. length), or the ordinary pattern (2 ft. 6 in. length). The "Midget" single enclosure type M lamp

(16½ in. overall, weight 6½ lb. complete with globe) should also be mentioned. We understand that the Metropolitan Wagon Co. have made use of the firm's single enclosure lamps to the number of 500 for their private installation purposes. Of the Nernst lamps and fittings and also the tantalum lamps, Messrs. Drake & Gorham are, of course, well known suppliers. For the Nernst type they give

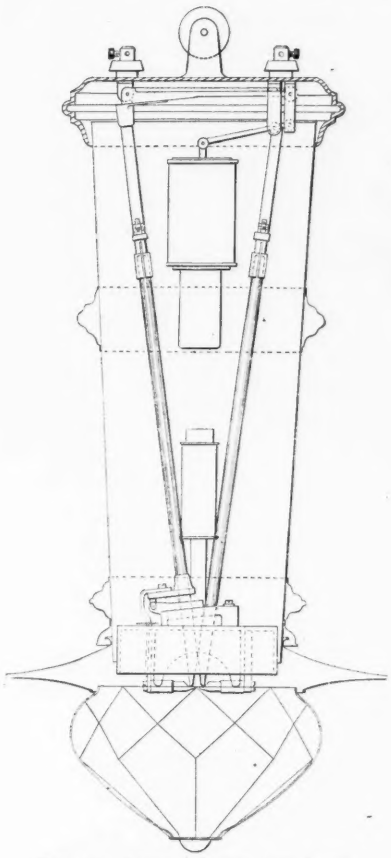


Fig. 53.—Jandus Flame Arc Lamp.

special guarantees as to the number of hours' life to be obtained for street lighting contracts.

One other point gleaned in the course of our interview, which ought really to be printed in large type—were that our practice in such matters—is of special interest to electrical engineers, as it relates to a new direction in which the firm are now launching out. Let electrical engineers and the trade then take note in their memories and in their sometimes more reliable note-books, that Messrs. Drake & Gorham, Ltd., have established works at Felix Street, Westminster Bridge Road, London, S.W., for the manufacture of switchgear of all kinds, both for high and low-tension service.

New Direct-Current Ozone Sets.

The "E.O.S." d.c. ozoniser, which is illustrated herewith (fig. 54) has been adapted to work directly from the mains by means of a specially designed coil. Hitherto it has been impossible to work an ozoniser from the direct-current mains without the intervention of either a rotary transformer or large and expensive resistances; to avoid this expense accumulators have generally been used, as in the case of the "E.O.S." Alpha ozonisers, a system which gives excellent results when no public supply is available. The present set has many advantages over the latter, however, as it can be readily adapted to work with direct current, whatever the voltage, by the insertion of incandescent lamps in the sockets provided, the lamps being of the same voltage as the supply; *e.g.*, if it is desired to work on a 200-volt circuit then 200-volt lamps must be inserted. A further advantage is that continuous working can be obtained without the trouble of recharging and replacing accumulators, and the yield of ozone may be regulated by inserting one or more lamps of lower candle-power than those supplied with the apparatus. The apparatus is light and compact, and can be carried by hand from house to house and used wherever the current is available. It can also be used on alternating current for short periods if desired.

The apparatus is manufactured for the patentees by Messrs. William McGeoch & Co., Ltd., and can be had from either their Glasgow, Birmingham or London premises.

We learn that Messrs. McGeoch are about to remove from their present address (Morrison's Court, 108, Argyle Street, Glasgow) to new and handsome premises of much larger size which they are building at 28, West Campbell Street, Glasgow; in the new establishment adequate provision will be made for show-rooms, and arrangements for showing, stocking and rapidly handling electrical fittings and material of all descriptions, the plans being especially designed for this purpose. The firm will shortly issue an entirely new catalogue of Ship's Electric Fittings, which is now in course of preparation, and has recently taken up the sole agency for

Fig. 54.—The "E.O.S." d.c. Ozoniser.

Scotland for the sale of Messrs. Laurie & Inglefield's patent travelling electric light; the latter has been previously described in the Electrical Review, so we need only mention that it consists of a device by means of which an electric lamp may have a range of 70 ft. along a room, the flexible being supported in loops on a stretched wire, and that it has already achieved a considerable degree of popularity. Obviously by this means one lamp can replace many, and it is impossible to leave more than one lamp burning, so that energy costs are diminished as well as capital outlay on wiring.

Wandsworth Switches.

The accompanying illustration (fig. 55) shows a patent 5-ampere link tumbler switch (No. 15) manufactured by the Wandsworth Electrical Manufacturing Co., Ltd., 9, St. Paul's Square, Birmingham. The special features claimed for the switch are exceptionally long break, knife contacts, and the avoidance of moving parts working on insulation, which is of ebonite throughout. This switch, which has been introduced during the past three months, already has a very large sale. We understand that it is being fitted into Longrove Asylum (under the L.C.C.), Down's Schools (under the Metropolitan Board of Works), Whitchurch Asylum Cardiff, and many other public buildings. Such switches are also

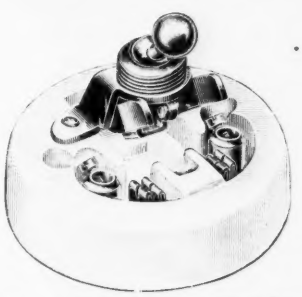


Fig. 55.—5-ampere Link Tumbler Switch.

supplied to the principal railway companies, and are specified for use by the leading consultants. Contractors are invited to write for a sample. The Wandsworth Electrical Manufacturing Co., Ltd., are manufacturers of main switches and fuseboards in teak or iron cases, main switchboards, &c., and we hear they will shortly introduce a patent two-way tumbler switch, designed on the same lines as their ordinary switches. The London depôt of the firm is at Robert's Works, Hampstead Road, N.W., and all London inquiries should be sent to Mr. Galsworthy at that address. Mr. Galsworthy is the London director of the firm.

"Carron" Electric Radiator.

As we recently mentioned, the Carron Co., of Carron, Stirlingshire, N.B., are introducing a new pattern of electric radiator, fitted with four heating lamps. A special feature of the company's work is the production of iron castings of all kinds for electrical purposes, from specially selected metal, which are thoroughly tested before leaving the works, and the frame of the radiator in question is made of this material.

"Ideal" Electric Lighting Plant.

Messrs. R. J. Nicholson & Co., of Macdonald's Lane, Manchester, are making a convenient little combined petrol engine and dynamo for private house lighting, as illustrated herewith. The engine is of the two-cycle type, and has no separate valves, the ports being opened and closed by the piston itself. It is claimed that this engine is remarkably free from vibration, while the space occupied is a minimum. The company has just issued an artistic brochure styled "Light in the Country," in which the numerous

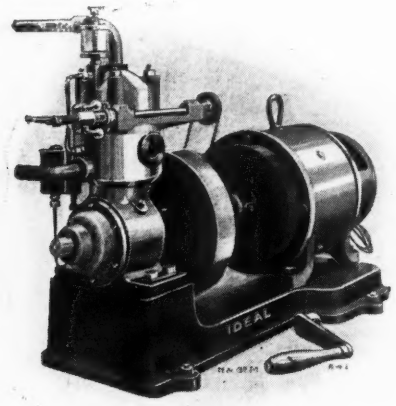


Fig. 56.—"Ideal" Electric Lighting Plant.

applications of electricity in a country house or farm are described in entertaining fashion, with appropriate illustrations. The electrical apparatus is shown and described, the "Ideal" plant being employed, and prices are given for a number of complete outfits embracing from 10 to 100 lights. An "Inquiry Form" is inset for the use of prospective customers, who can thus furnish the particulars necessary for the preparation of an estimate. The booklet is certainly something out of the common.

"Harrison" Universal Photometer.

Messrs. Elliott Bros., of Century Works, Lewisham, call this a "universal" photometer, because it can be used to measure the illumination derived from, or the candle-power of, a lamp of any nature, under a large variety of conditions, such as are found, for instance, in the test room, in an ordinary room, or in the street.

They do not claim that the instrument measures with such a degree of accuracy as to be of use for standardising standard lamps, for the reason that the instrument itself depends for its operation

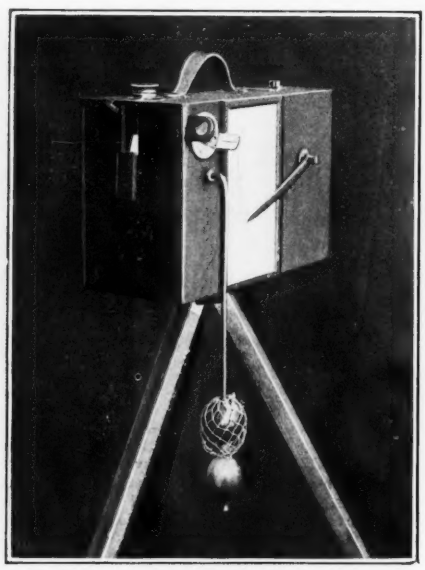


Fig. 57.—The "Harrison" Universal Photometer.

on the sub-standard it contains; but for practical purposes, in the hands of an intelligent operator, it can be relied upon to give results within 5 per cent. The instrument is calibrated in candle-feet, which reading it is only necessary to multiply by the distance squared of the photometer screen from the lamp under measurement, to reduce it from candle-feet to candle-power.

The chief novelty of this instrument lies in the fact that it embodies a flicker disk, somewhat of the Whiteman pattern, but rotated by a blast of air under the control of the operator: this not only results in the instrument being suitable for measuring all types of lamps, of which the spectrum varies considerably, but also in a light, portable and inexpensive instrument.

In order to make the instrument compact and easy to operate, the photometer bar and sliding lamp have been replaced by a reflecting screen with an angular adjustment; this is moved by means of a pointer attached to it. Thus the balance can be rapidly obtained, and the illumination read off direct from the scale.

The dimensions and weight of the instrument are such as to make it easily portable; the instrument, with the exception of the stand, is self-contained, and always ready for use.

The instrument should be set up at a distance of about 10 ft. from lamps of 20 to 50 c.p., the distance being increased in proportion roughly to the square root of the candle-power, and reaching 60 ft. for 800 to 2,000 c.p. It is not essential that the instrument should be absolutely level; but the angle of incidence should be taken (by turning the sector lens so that the light spot falls on the line, and then reading the angle) in order to correct for the angle of incidence as shown in the correction table.

The opening exposing the sector disk should be pointed towards the source of light, so that the light falls on it at right angles to the horizontal. The distance of the lamp from the disk can be measured by the knob on the side of the instrument, which is placed there for the purpose.

Having set up the instrument, all that is necessary is to rotate the sector disk by means of the air-pressure bulb provided for the purpose. The standard lamp having been lighted by inserting the plug, the pointer can be moved until that position is arrived at when the operator, looking through the telescope, can see no flicker. The pointer will then read the illumination in candle-feet at that distance from the light, and at that angle of incidence, indicated by the lens and sector on the edge of the instrument.

From time to time it may be considered advisable to check the instrument. This can easily be done by fixing a lamp of known candle-power (preferably an incandescent electric, with a known voltage) at various distances from the instrument, and making measurements. Care should be taken to do this in a room having walls with little reflective power, or in the open on a dark night.

Other new apparatus put forward by Messrs. Elliott Bros. include the Century standard testing set, of which Pamphlet D.C. 94 gives particulars, and a series of lamp-testing wattmeters, listed in Pamphlet No. A.C. 63. The testing set is generally similar to the original device of that name, but has been improved in detail, and deals with currents from ·0002 to 600 amperes, pressures from ·001 to 750 volts, powers from ·000002 to 450 kw., resistances from ·000002 ohm upwards, and insulation to 5 megohms.

Movable Armoured Installation.

The principle of the Niphan system of couplings for electrical cables and movable armoured installations, of which Messrs. Simmonds Bros., Ltd, 4-8, Newton Street, High Holborn, W.C.,

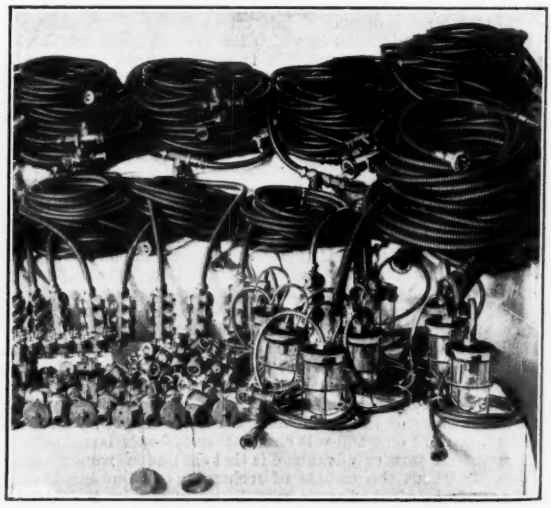


Fig. 58.—Part of a Consignment of Armoured Cable and Fittings for Military Purposes.

make a speciality, is familiar to our readers by reason of descriptions which have already appeared in the Electrical Review. We revert to the matter now because we recently had an opportunity of inspecting a large consignment of movable armoured material which they had in readiness for dispatch to the order of Messrs. Crompton, for the Government of India, for military purposes. Though the general principle is the same, the present contract included a number of new and special designs

which have been called for in connection with this particular development in the application of the system. The couplings employed are adaptable for any number of ways or points up to the limit of the capacity of the cable, and some of those used in this particular work are six-way fittings, but from these many more

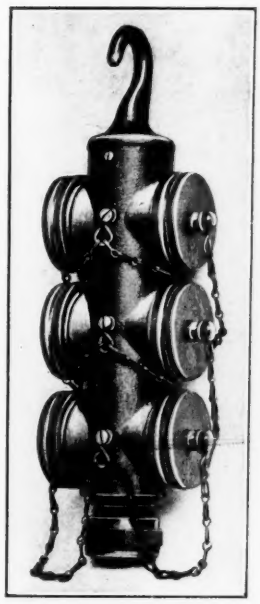


Fig. 59.—Niphan Coupling.

lines may be carried according to the circumstances to be dealt with. It can easily be imagined that in military service, the idea could play many useful parts; this is particularly the case seeing that it is designed so as to be quite suitable for the use of unskilled men. All parts supplied are made interchangeable. This is a new application of Messrs. Simmonds's system, but it is not, if we judge correctly, the last order they will receive in the same direction.

Portable Electric Drills.

In the accompanying illustrations we show a couple of designs of portable electric drills, from among the many which are being offered by Messrs. Siemens Brothers' Dynamo Works, Ltd.

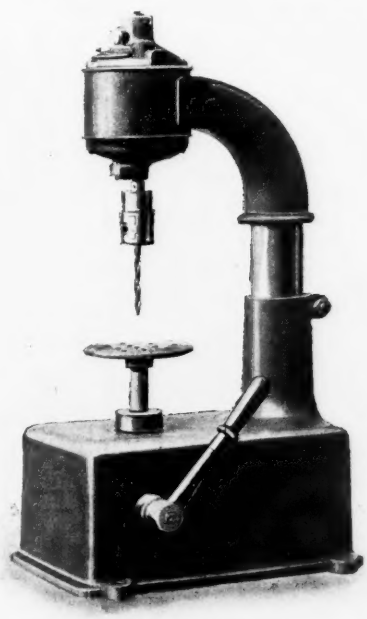


Fig. 60.—Siemens's Bench Drilling Machine, with "Oneida" Chuck and Drill.

Fig. 60 is a bench drilling machine for one or two speeds. It has a cast-iron frame made in two parts: the upper part, with which the motor is combined, can be adjusted in the vertical direction. The feed is effected by raising the table, which is operated by means of a rack worked by a pinion on the spindle of the lever. A switch in the motor circuit is let into the lever handle. This machine has two drill spindles, and the speed is altered by attaching the drill to the one or the other. Machines for two speeds and with only one drill spindle have their speed adjusted by a change-over gear. Some patterns can be arranged for special speeds, if necessary, by the use of other gears. The machines are specially adapted for use in clock factories, small workshops, machine shops, &c., as they can be easily erected, and do not occupy much space. In fig. 61 we show

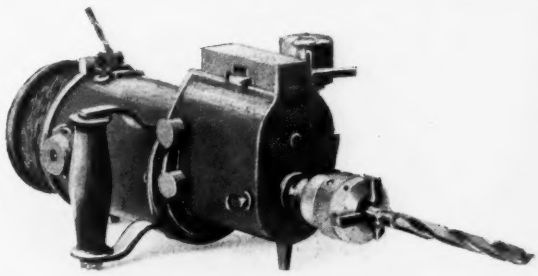


Fig. 61.—Universal Hand Machine, with Cushman Chuck and Drill.

the firm's Universal hand-drilling machine for three speeds, which is supplied with either a continuous-current or a three-phase squirrel cage motor. These Universal machines have a change-over gear, by means of which the drilling spindle can be quickly and easily made to run at the three different speeds. A breastplate is fitted, without which the machines must not be used. A switch in the motor circuit is let into one of the handles.

"Sunræ" Flame Arc Lamps.

In addition to their well-known patterns of enclosed arc lamps (Davy's patent) for direct and alternating current, Messrs. Arc Lamps, Ltd., of St. Paul's Crescent, Camden Town, N.W., have

Fig. 62.—"Sunræ" Flame Arc Lamp.

brought out a flame arc lamp, to which they have given the name "Sunræ." This lamp is suitable for both A.C. and D.C., the former type being provided with a choking coil, and the latter with a line

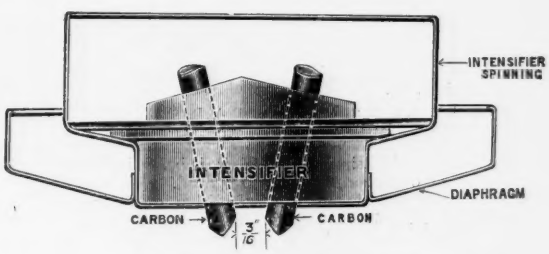


Fig. 63.—Detail of Intensifier.

resistance. The flame arc may be white or golden coloured, and the special carbons are said to be no more expensive than ordinary carbons.

The overall length of the lamp is 30 in., and the carbons last for from 16 to 40 hours. As will be seen from the accompanying

illustrations, figs. 62 and 63, the carbons are fed downwards; there are two pairs of carbons in each lamp, which pass through an intensifier, beneath which the arc is formed. All the carbons are of the same diameter, and they are easily pushed into spring holders. The potential difference between the terminals of the lamp is from 36 to 40 volts D.C. and slightly less with A.C., the arc being from $\frac{5}{16}$ to $\frac{1}{4}$ in. in length. Particulars of this and other lamps are given in a price list recently issued by the company.

The lamps can be run singly on 50 volts, or in series at about the same voltage per lamp; the minimum current recommended is 6 or 8 amperes, the standard being 10 amperes.

FIG. 66.—FIVE-LIGHT "SHERATON" CEILING FITTING, IN DEAD GILT FINISH. SCALE $\frac{1}{6}$TH.

FIG. 67.—TWO-LIGHT "SHERATON" BRACKET. SCALE $\frac{1}{6}$TH.

The Boddy Lamp and Adapter.

In the accompanying fig. 65 we show a speciality introduced by MESSRS. G. M. BODDY & CO., of 18, Newington, Liverpool. It is an adapter which enables a small size lamp to be used with ordinary holders.

The miniature lamp, fig. 64, is specially adapted for decorative purposes, advertising signs, theatre lighting, &c., and is very suitable for mansion house lighting, for which it is being largely ordered when some form of special lighting is required.

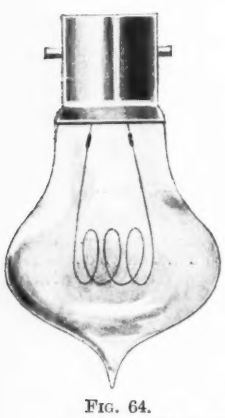


FIG. 64.

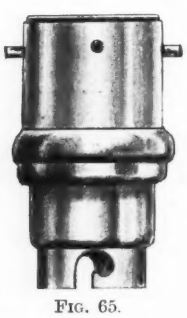


FIG. 65.

BODDY'S MINIATURE LAMP AND ADAPTER.

Messrs. Boddy have issued a new edition of their catalogue (60 pp. about 5 in. × 7 in.) showing in an excellent manner their various shapes and styles, plain and fancy, of incandescent lamps.

Art Fittings.

The ELECTRICAL FITTINGS CO., of 38, Conduit Street, New Bond Street, London, have an extremely choice collection of art metal work, displayed with considerable taste in their showrooms. At the works there are some 3,000 men employed in the production of all that is beautiful in the way of art metal working—most of them men who have for years specialised in this branch of handicraft and industry. A general idea of the wide scope of the works operations may be imagined if we mention that at whatever stage of life art can lend a hand—in embellishing a cradle, in beautifying an electrolier for a marriage gift, or decorating a coffin—they are at your elbow with some appropriate design. Designs and effects are executed for harmonising with all styles of furnishing and decoration, and it is not surprising that so wide an experience in art metal designing should have led to the production of some exceptionally pleasing examples of electric light fittings, whether in electroliers, pendants or brackets. The Adams and Georgian styles are chiefly in demand at present.

FIG. 69.—PENDANT FOR ONE LIGHT, WITH CUT-GLASS SHADE (SHERATON). SCALE $\frac{1}{6}$TH.

FIG. 68.—TWO-LIGHT BRACKET, OXIDISED SILVER FINISH. $\frac{1}{6}$TH SCALE.

Our illustrations (figs. 66 to 69), which have been selected with some difficulty, because of the abundance of the good things available, represent a charming two-light bracket, which is supplied with oxidised silver finish; a two-light "Sheraton" bracket; a five-light ceiling fitting in dead gilt finish; and a pendant for one light with choice cut-glass shade.

The company will shortly be issuing a large and comprehensive catalogue of electric lighting fittings, &c.

Sunbeam Lamp Co., Ltd.

This company's illuminating specialities are by now very well known. The Sunbeam lamp works are quite up-to-date, and complete lamps, even to the glass bulbs, are there produced.

Among the favourite Sunbeam productions, we may briefly refer to the company's reducing lamp, which offers the user the chance

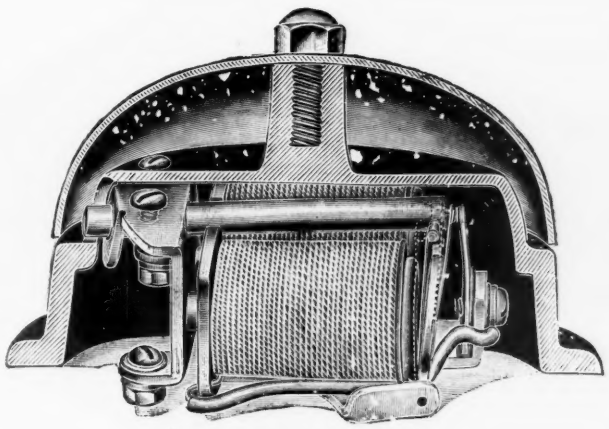


Fig. 70.—The "Monitor" Bell.

of a dim light, about 1 c.p., and fills a long-felt want; also the "Outshine" lamp which has been designed specially for reflecting the greater portion of the light downward.

Among other specialities may be mentioned the Monitor Bell, which has been designed for outdoor use, as, for instance, on tramcars, motor-cars, &c., where weatherproof qualities are essential. Our illustration (fig. 70) shows a section through the gong; the

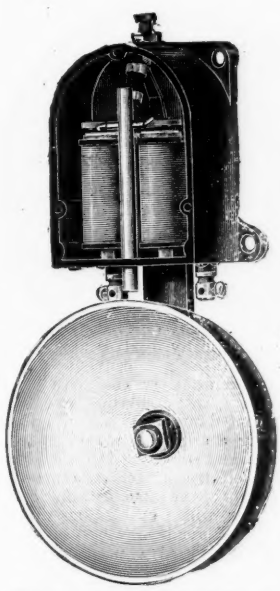


Fig. 71.—The "Recti" Bell.

hammer rod is supported in two places and thrown straight out and in by the armature, striking the gong on the inside. The cast-iron base is convex and cast in one piece, the mechanism being entirely enclosed and practically fool-proof; and the workmanship and materials are a special feature. The "Recti" Bell (fig. 71), by the same company, is designed for high voltage working. The striking movement is similar to that described above, but enclosed in a separate iron case, as shown.

These bells can be connected up to ordinary lighting or power circuits, and thus obviate the use of dry cells.

New Switchgear.

The Switchgear Co., Ltd., of Birmingham, have recently introduced several new and important articles, chief amongst them being a new model of circuit-breaker for direct currents. This is known as model C, and is made in sizes of from 400 amperes to 1,500 amperes. The circuit-breaker is heavily built, and being

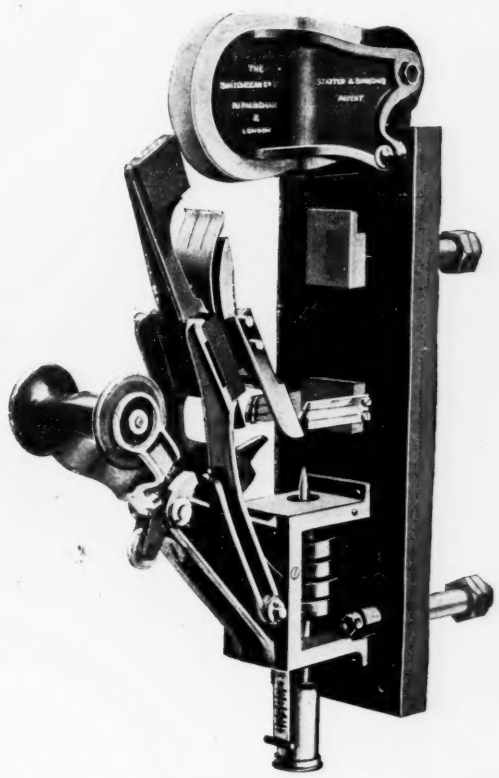


Fig. 72.—Model C Circuit-breaker, with Statter Patent Time Lag and Magnetic Blow-out.

exceedingly strong, will stand any amount of rough usage. It is provided with a free handle, making it impossible to close it or hold it closed on an overload or short circuit. The stirrup handle is arranged to pull down to close the circuit, the brush being squeezed down on the contacts by means of a roller attached to the handle casting acting on an inclined plane. A magnetic blow-out attachment can be added where desired, although the length and type of break are quite sufficient to deal with anything up to a dead short without the aid of the magnetic blow-out.

The addition of the Statter patent time lag to this circuit-breaker makes it a suitable instrument for the protection of generators and large motors, as it delays its operation for a certain period

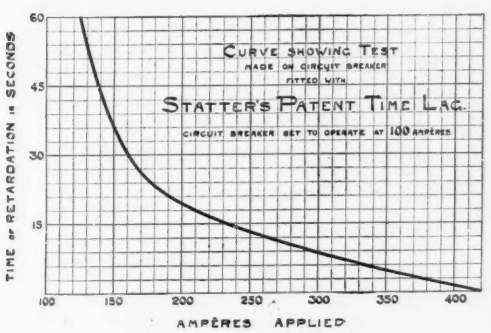


Fig. 73.—Curve of Time Lag.

dependent on the amount of overload, a true inverse time element, giving long periods of lag amounting to as much as half an hour for mild overloads, and only a matter of seconds, or a fraction of a second, in the case of large overloads or short circuits.

A time lag relay giving the same effect forms one of their new instruments; it can be wired up to all motor starters which have a no-load release of the type wherein the no-load magnet is in series with the shunt of the motor.

The curve of the time lag, fig. 73, is hyperbolic; its upper part interests motor users chiefly, as corresponding to periods of long lag. For lack of space the curve is cut off at 25 per cent. overload where the

lag is one minute; a curve drawn to another scale is necessary to show the time lag for small overloads, like 10 or 15 per cent, where there is a delay of several minutes. The lower part of the curve after the bend is the most interesting; it is by reason of this happily-shaped curve that the firm are able to arrange the time lag of heavy

Fig. 74.—Oil Tank, H.C. Switch.

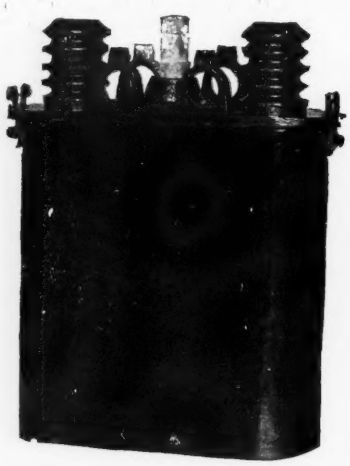


Fig. 75.—Statter Oil Switch Unit.

circuit-breakers for the protection of mains and large generators, so that when a short occurs they do not all come out—as often happens when circuit-breakers without time lags are employed and set as usual for 50 per cent. overload—but only the breaker controlling the particular circuit on which the short occurs. This valuable feature of Mr. Statter's patent time lag is not yet sufficiently appreciated by central station engineers, and the firm are accordingly prepared to demonstrate this action to those who are interested.

The firm are also introducing a new series of automatic oil break switches. The construction of these oil switches embodies several new and valuable features. One of these is the use of moulded indurated fibre for the oil tanks and tank covers. The fibre, after being moulded and pressed into the desired shape, is treated by a special process which gives to it insulating qualities substantially equal to those of porcelain. The oil tanks being of fibre, and, therefore, requiring no insulating lining, are moulded in the shape shown in fig. 74 for high pressures. It will be seen from this that as the wooden switch rod lies in the centre cell, a complete barrier is formed between the arcing points of the switch

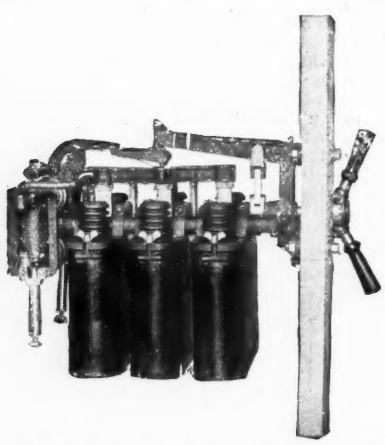


Fig. 76.—Three-Pole Type H.A. Automatic Circuit-Breaker.

unit. The cover, with its insulators, is arranged so that the connection to the line cables is made below the surface of the oil. As a separate tank is used for each phase, there is, therefore, no danger whatever of any short circuit within the switch. Two, three and four-pole combinations are built up of the switch unit shown in fig. 75. These are clamped side by side and supported by lengths of seamless steel tubing secured to the switchboard plate. The contact is made by laminated brushes bedding on wedge-shaped contact blocks. This method eliminates the danger of sticking or "freezing" at the critical moment, and also ensures a perfect contact being made. The brushes are provided with a "flicker" to take the arcing, which is arranged so as to be readily removed and replaced should it become damaged in course of time. These switches are provided when required with automatic overload mechanism, which is placed at the end of the switch combination remote from the switchboard. When required these oil switches can be fitted with the Statter patent time lag attachment.

The switches are made automatic and non-automatic in a variety of forms. The type H.A. shown in fig. 76 is made for pressures up to 6,600 volts, while a similar but larger switch type H.C. is used for pressures up to 22,000 volts. Cheaper types are made with knife-blade contacts.

Baxendale Fittings.

The variety of lines covered by Messrs. Baxendale & Co., of Miller Street Works, Manchester, is so extensive that it is somewhat difficult to make a selection from their repertoire. Arc

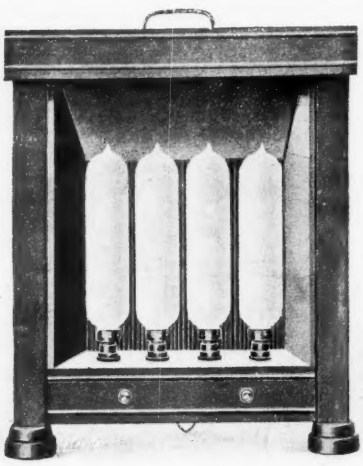


Fig. 77.—Baxendale Radiator.

lamps are a special feature of their business, and they carry large stocks of the principal patterns and carbons of the Union Electric Co., whose agents they are in the Manchester district; these are dealt with elsewhere in this issue, so we need only mention that the demand has been such that Messrs. Baxendale intend to give particular attention to this department in the future. They are about to issue a new catalogue of electric bell materials, medical apparatus, lightning conductors, &c., in a special binder which facilitates the substitution of new pages to keep the list up to date. Amongst other of their specialities are the "Beamolite" shop window reflectors of the channel type; prismatic shades, which are claimed to diffuse and reflect the light of the lamp in a downward direction; luminous radiators, of which one of many examples is shown in fig. 77; and the "Manchester" fitting for outdoor illumination, which is now made of copper instead of steel, well enamelled, and arranged either for a three-light ball fitting or for a Nernst lamp. Particulars of the "Thikflex" patent holder, which has attained a wide vogue, of the magazine fuse, the "Cantie" switch, and the transparent barrel bell-push have already been given in our pages.

For particulars of the many other interesting fittings and accessories, we must refer readers to the firm's new price lists, issued for the 1906 season.

Electrically-Heated Furnaces.

The Electrical Co., Ltd., of Charing Cross Road, W.C., are introducing some electrically heated annealing and hardening furnaces, which on the score of convenience, efficiency and cost are well worth consideration in comparison with gas or coke furnaces.

The company's patented furnace consists of a fireproof rectangular iron tank, containing a salt bath in a crucible, the latter being built into fireproof cement contained in the tank.

Two wrought-iron electrodes face each other on opposite sides of the crucible, and bars of the same material lead to a single-phase regulating transformer, which enables any pressure, from 5 to 25 volts, to be obtained for regulating the furnace temperature. The transformer will also give pressures up to 55 volts for starting up the furnace, approximately half an hour being required to bring it up to a white heat from cold; and with a furnace temperature of 1,300° C., the outside of the furnace can be handled comfortably.

Pyrometer measurements show an even temperature throughout the bath, except on the top surface, which is exposed to the air.

A bath of pure chloride of barium is used for temperatures above 1,000° C.; and for lower temperatures a solution consisting of two parts of the above to one part of chloride of lime.

Tests on a particular furnace show a watt consumption at a temperature of 880° C. of 5·4 kw.; at 1140° C. of 8·5 kw. and at 1,300° C. of 12·25 kw.

Owing to the perfect heat control which is possible, "wastes" can be practically eliminated, and the simpler and speedier operation represents an appreciably larger output.

Simplified Service Connections.

The system of the Simplified Underground Conductor Co., Ltd., who are represented in London by Mr. E. A. Brandon, of 55, Barbican, E.C., offers a cheap but efficient method of laying mains; it is particularly adapted for providing rapid service connections, owing to its simple constructive detail. The arrangement, which has previously been described by us, includes a system of bare copper or aluminium cables laid on porcelain supports in wood or metal troughing, and filled in with special insulating compound.

The Simplified service boxes and fittings have been specially designed to provide rapid connection to the distributing system. Our view, fig. 78, shows a standard box, of cast-iron, placed over the distributing trough, and attached thereto by means of a wrought-iron strap, which passes round the underside of the trough; also the service connection to the right. On the consumer's side of the box a square opening admits the service line troughing, the conductors passing in through a stout fibre division bushed with glazed porcelain.

For connecting up the service cables, the company's instantaneous clamp terminals are specially interesting. The arrangement consists practically of a terminal stud with a shank in halves, which can be clamped on to the distributor without interfering with it other than to dig out some of the carbolite box compound in the vicinity of the joint. Porcelain tubes slip over the terminals and rest on the distributing cables; the joints are said to have been tested to 2,000 amperes per sq. in. without heating.

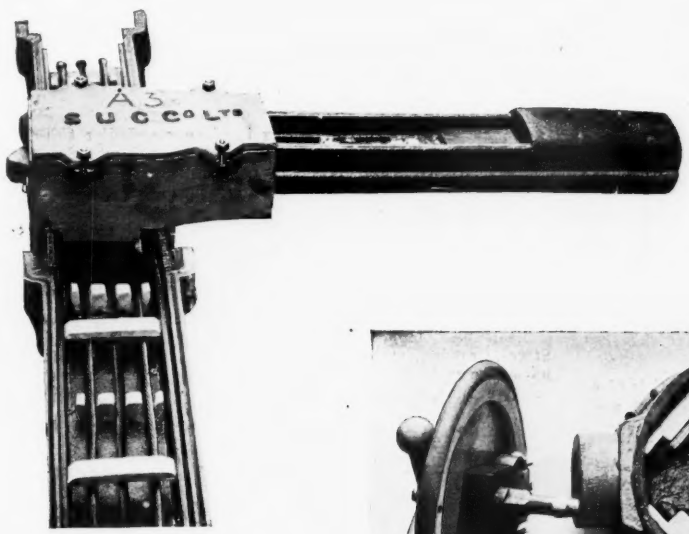


Fig. 78.—Simplified Service Connection.

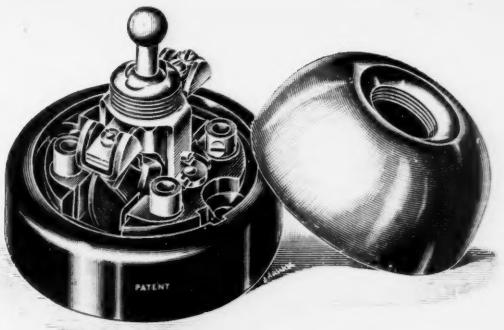


Fig. 81.—Three-way Tumbler Switch.

Fig. 82.—"Clincher" Wall Connection.

Fig. 83.—Tri-Pin Flush Connection.

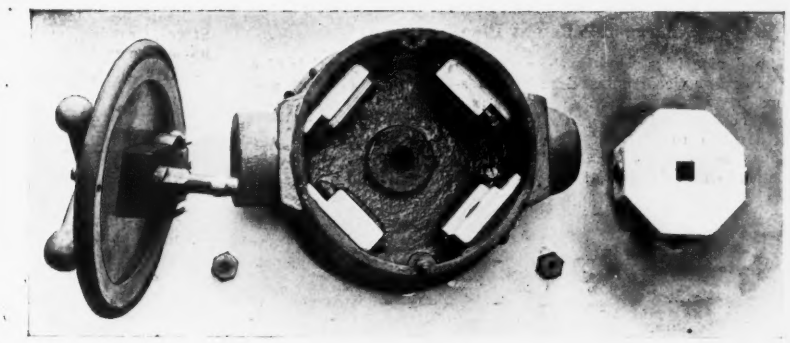


Fig. 79.—Simplified Quick-break D.P. Fuse Switch.

Fig. 79 shows a "simplified" quick-break double-pole fuse switch for street lighting purposes. The porcelain centre with metal contacts (on the right) fits inside the box shown, and is operated by the square shank projecting through the cover and shown on the left.

Lundberg Switches.

We illustrate in figs. 80 and 81 some new patterns of Messrs. A. P. Lundberg & Sons' (Liverpool Road, London, N.) patent series-parallel and "off," and whole or part and "off," tumbler switches. These have been reconstructed to bring them up-to-date in all respects. The working parts of each are more mechanically constructed than they were formerly, and the parts are interchangeable.

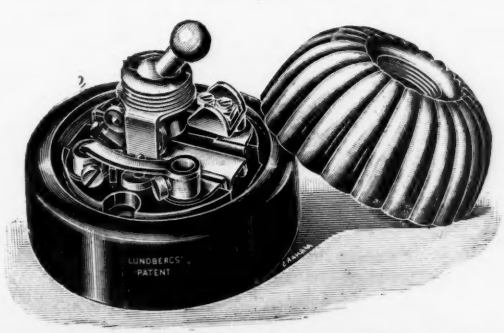


Fig. 80.—Series-Parallel Tumbler Switch.

The demand for special switches of these types has considerably increased owing to the numerous convenient and economical adaptations to which they can be put, either separately or together, for electroliers or distributed lighting in rooms, public halls, &c.

The series-parallel and "off" switch has proved particularly useful for hospital, ward and ordinary domestic bedroom use.

The "three-way" tumbler switch has received similar attention as regards construction.

Fig. 82 shows the "clincher" type of connection; this is a novelty in wall connectors, and is particularly adaptable for fixing in skirtings, panelling, furniture and similar woodwork. A hole is made of the correct size to admit the socket part, after connection is made with the leads, and the socket is forced in and held securely in position by the spring of the four prongs formed out of one piece of metal, which also forms the flange. In this manner it makes a very simple and neat fitting, without any objectionable fixing screws to become jagged by careless workmen. The centre porcelain part is Messrs. Lundberg's standard "advance" pattern. Fig. 84, p. 636, shows the "quadruflex" ceiling rose, which is provided with four contact plates, each with a loop-in terminal and two screws for flexibles. It is adaptable for several convenient wiring arrangements in combination with suitable switches, *e.g.*: (1) Controlling suspension lamps in series or parallel, (2) for suspension "three-way" switch, (3) for suspension "pivot intermediate" tumbler switch, and for various groupings of lamps in an electrolier or in a room. Another of Messrs. Lundberg's specialities is the "Multiflex" ceiling rose, which is also a useful type, and has suitable connections for five

separate circuits. It is serviceable for billiard-table lighting, &c., also for various convenient groupings of lamps in an electrolier or in a room, when in circuit with suitable switches. When some novel apparatus is produced, these two types of ceiling rose will be found very useful.

The "Tri-pin" flush connection (fig. 83, p. 635) is another device, with several adaptations, particularly in connection with two-way wiring, two-filament (high and low C.P.), heating apparatus, &c., also in conjunction with "Duplex" two-way and "off" and "whole or part" and "off" switches. One of the three pins being made larger than the other two, the plug can only be inserted in one way; this is essential in some adaptations. Surface and semi-flush types, interchangeable with the flush type, are also made.

Various other novelties have been delayed in production, but are well in hand; they consist of new type surface and flush two-pin wall and floor connections of "Dot," "Universal" and "Magnum" standard gauges, spring-hinged flush connections, a "Reverse" type of porcelain door contact for strong rooms, &c., a 10-ampere size of pivot combination switch and wall connection for heating purposes, and numerous improvements in special types of branch switches, &c.

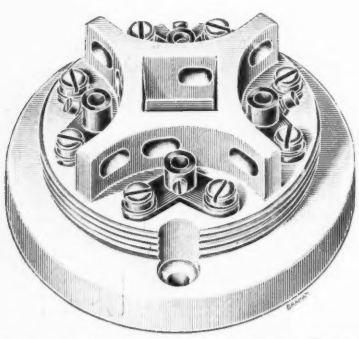


Fig. 84.—Lundberg "Quadruflex" Ceiling Rose.

"Paragon" Patent Pipe Standard.

The device illustrated in the accompanying fig. 85 consists of a portable pipe vice, combined with a tube-bending attachment, and is made by the Oldbury Steel Conduits, Ltd., of Birchfield Lane, Oldbury. It is light and strong, requires no fixing, and is easily taken to pieces for packing. It will be noticed that a bracket is provided in addition to the vice, and this takes the excessive strain off the latter, while both the vice and the bracket clamp are of the instantaneous grip pattern. The pipe-bending wheel is shown on the middle of the standard, and a tool tray is fixed in a convenient position. The whole thing weighs 46 lb., and can be packed in a space of 4 ft. × 1 ft. × 6 in. It is claimed that a considerable economy in labour can be effected by the use of this apparatus.

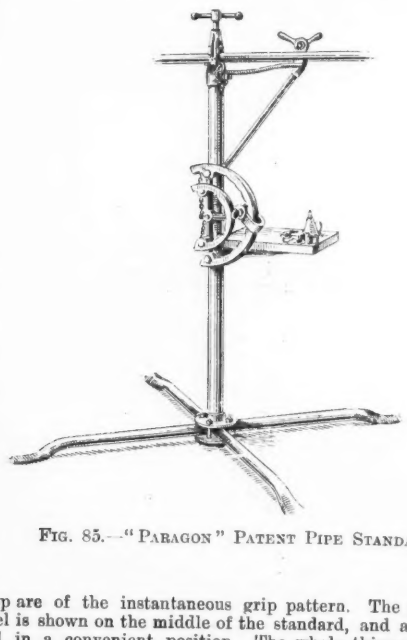


Fig. 85.—"Paragon" Patent Pipe Standard.

The roller-bearing elbows, tee-pieces, &c., recently introduced by the company were described, with illustrations, in our issue of August 24th, p. 294; by means of these fittings the drawing-in of wires is greatly facilitated.

Walsall Conduits.

The Walsall Hardware Manufacturing Co., of Hatherton Street, Walsall, are pushing forward with improvements in their conduits and fittings.

The firm's patent grip coupling, which enables a metallic connection to be made without the use of screwed joints, is in future to be utilised for the whole range of the company's fittings, the coupling and fitting being made in one piece.

The arrangement enables all loose parts to be dispensed with, reducing the cost and facilitating the fitting of conduit work.

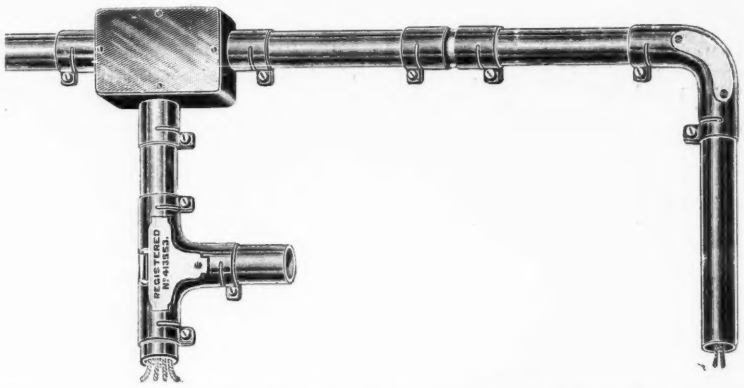


Fig. 86.—Walsall Conduits and Grip Couplings.

The method of fixing the fitting is, of course, similar to that of the coupling, as shown in the figure, care being taken to clear away any enamel where metallic contact is required.

The company's patent interchangeable junction boxes are designed to offer similar facilities in erection; they will take from one to eight tubes, according to size, and a screwdriver is the only tool required to make any alteration.

Arc Lamp Lowering Gear.

Since we first noticed the ingenious and original lowering gear and self-sustaining winch of the London Electric Firm, of George Street, Croydon, we understand that an enormous number of these have been sold. By the courtesy of the makers, we are now enabled to give illustrations showing the extremely simple and clever construction of the devices in question, of which the details have not hitherto been available for publication.

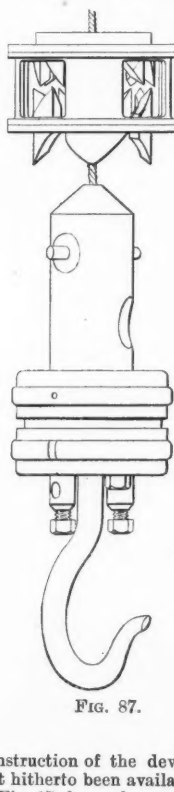


Fig. 87.

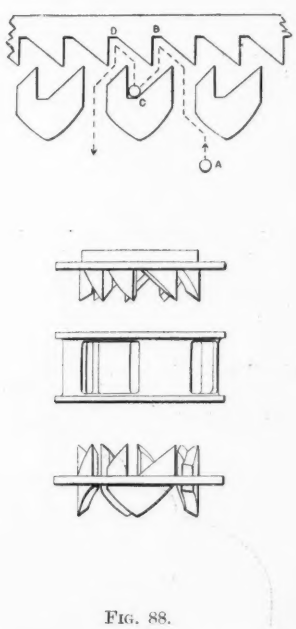


Fig. 88.

Fig. 87 shows the complete suspension gear, and fig. 88 shows the separate parts of the ratchet fitting, together with a diagram showing the operation of the latter. It will be seen that a pin A pulled up against the lower ratchet will find its way up to the point B, in the upper ratchet; on then lowering, it lodges securely in the angle C of the lower ratchet. This is the position when the

lamp is suspended, and the weight is taken off the suspension cable. If now the pin is again pulled upwards, it cannot fail to be guided to the point D, and on lowering it passes down and out of the ratchets. Simplicity and certainty of action are here obvious, and as the only moving part is the plug shown in fig. 87, the claim of "one working part" is justified. The ratchet device, as shown in fig. 88, consists of three parts, firmly screwed together and fixed into the hood. There is nothing to get out of order or to wear out. The plug presents no special features; it carries the supporting pins and two coaxial spring rings for the electrical contacts, which are well insulated from the hook and other metal parts; and the whole is substantially constructed with fibre or ebonite insulation.

The winch is shown in fig. 89. The base is provided with a two-lobed groove A, in which run three pins B, attached to a loose disk; the other ends of the pins C enter annular grooves D in the cheek of the barrel. A central spindle passing through the barrel concentrically has an eccentric F at one end, which fits into the

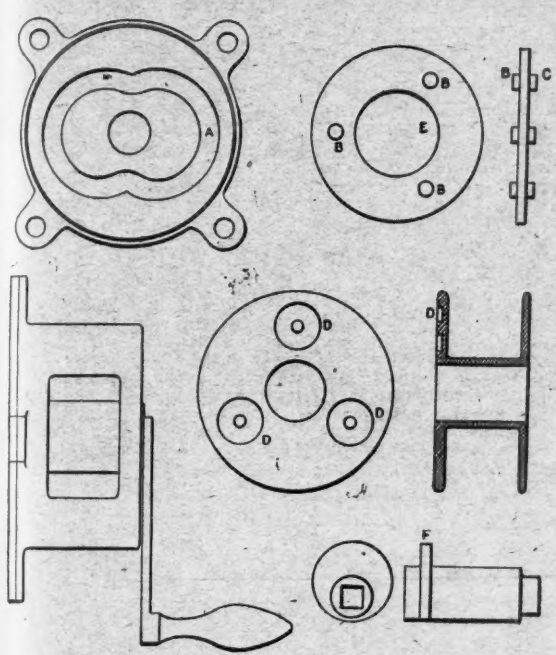


FIG. 89.—DETAILS OF WINCH.

aperture E in the loose disk. We are not prepared to discuss the kinematics of this curious combination; we merely state the fact that when the spindle is rotated by means of a key which fits into the square in its end, the barrel of the winch rotates at one-third the speed of the spindle, and that the gear is perfectly self-sustaining.

The London Electric Firm intends shortly to bring out a two-stage lowering gear, to enable arc lamps in central and other stations to be hung from the roof below the level of the crane, by means of an ingenious combination of a telescoping tube and the lowering gear described above. This will enable the lamps to be placed in positions where their light will be more efficiently utilised than under the existing system of hanging the lamps above the crane, or below it on wall brackets. A new gear is also on the way, by means of which it will be possible to lower centre-pole arc lamps to the ground for trimming. It makes use of a canting carrier mounted on the top of the pole, and the whole operation of canting the carrier, lowering the lamp, rehoisting, locking the frame in position and taking the weight of the lamp off the rope will be effected with a single winch and rope.

B.T.-H. Arc Lamps.

The construction of the several types of enclosed arc lamps manufactured by the BRITISH THOMSON-HOUSTON CO., LTD., of Rugby, is described in a pamphlet which has recently been published. In addition to small illustrations of the various parts of the lamps, there are some half-tone photographic reproductions showing a wire-weaving department at Warrington which is lighted by the lamps, also a fine example of street standard at Leeds bearing five of the lamps, and the railway goods yard of the North-Eastern at Newcastle, where there are some 900 of these enclosed lamps installed.

Dowsing Radiators.

Some very handsome designs of luminous electric radiators are being offered by the DOWSING RADIANT HEAT CO., LTD., 24, Budge Row, London, E.C., just now, and in a four-page list that is being circulated, these are illustrated, a brief description of each, with particulars of prices, being given. They are variously fan-shaped, circular type, square-type, in antique hammered and other metal work, and cast-iron with coppered reflectors.

Holmes's Installations.

"Electric Light and Power Installations Illustrated" is the title of a finely produced publication issued by MESSRS. J. H. HOLMES & CO., of Newcastle-on-Tyne. The one before us is a new edition (1906), and it contains excellent photographs of, and some general descriptive notes regarding, contracts which they have carried out for electrical installations on land and sea. These include a number of important public electric light and tramway generating stations; a large number of vessels and floating docks and workshops; textile mills in India, Lancashire, Yorkshire, Scotland, &c.; newspaper and printing establishments and paper mills; engineering works, shipyards, mines, railways, and so forth. A few views also appear of country houses at which the firm have erected private installations.

Sun Radiators and Advertising Signs.

The SUN ELECTRICAL CO., LTD., of Charing Cross Road, W.C., are bringing out a number of new designs of luminous radiators, and also some advertising signs for use in connection with the Sun

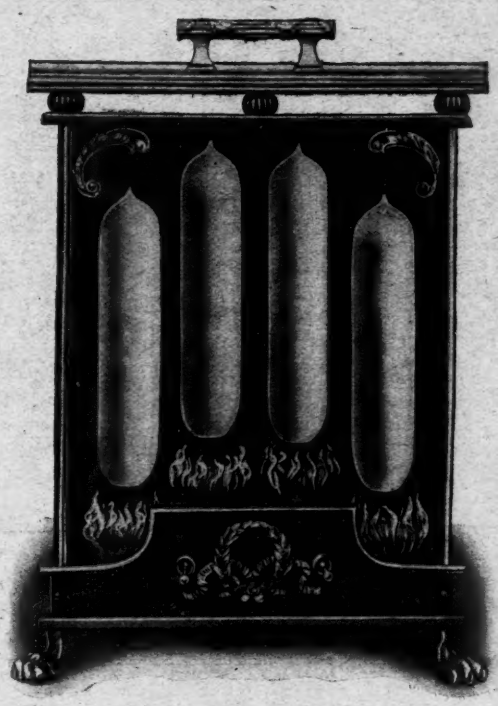


FIG. 90.—SUN LOUIS XVI RADIATOR.

thermo-blink motorless flasher. The design of radiator illustrated in fig. 90 is a handsome example in cast brass in Louis XVI style; it is, as a rule, finished in gilt colour, and has a fine appearance whether illuminated or not. Others that may be mentioned, and would be illustrated had we the room to spare, are the four-lamp type, which is made in either hammered copper or brass and fitted with enamels, and a three-lamp combination finished in art bronze colour. In fig. 91 we illustrate a sign which has been designed as an attraction for the counter, and while it fills that useful office it

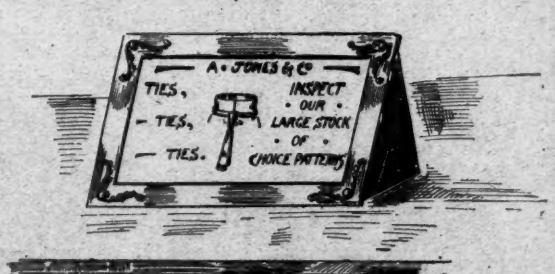


FIG. 91.—THERMO-BLINK FLASHER.

will also serve as a counter attraction to many other things. In size it is about 10 in. × 8 in. The Sun Co.'s thermo-blink flasher with holder and lamp is fitted inside, the glass front being arranged so that it is easily detachable. The shop-keeper or merchant who wishes to draw attention to his specialities, thus has the option of putting in a fresh notice whenever he pleases; this being flashed up at frequent intervals does not fail to attract notice, with the invariable following up of increased sales. The price of this device works out, complete with flasher, at only a few shillings. Fig. 92 represents a small lantern suitable for fixing to the lintel of doorways or facia boards, and is arranged to take the flasher inside

the lantern, or, when necessary, it can be fitted elsewhere. Other and more elaborate designs are being made, details and prices of which can be given on application. The company have in preparation a new season's list of radiators illustrating a number of their

Fig. 92.—Sun Flashing Lantern Sign.

latest patterns, which will be ready shortly, likewise a series of illustrations showing what they are doing in advertising lanterns and box signs, &c.

Bedroom Lighting.

An ingenious mode of providing two—or rather three—degrees of lighting with one switch has been devised by the Auto-Claw Co., Ltd., of 38 and 39, Beech Street, E.C. The arrangement is shown in the accompanying diagram, and is effected by the use of the Auto-Claw switch with "off" position. This is connected up so that in one "on" position the 240-volt 16-c.p. lamp is direct on the mains, giving full candle-power, while in the other "on"

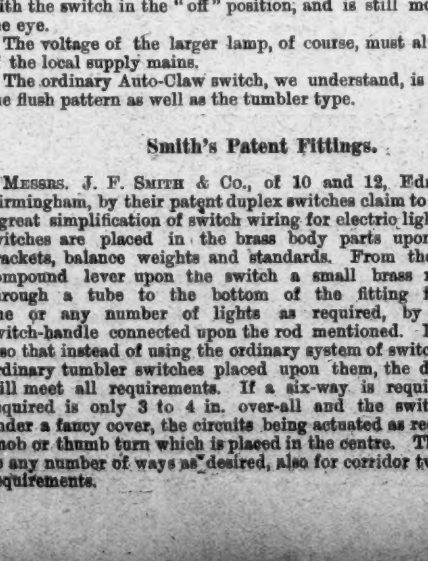


Fig. 93.—Diagram of Connections for Bedroom Lighting.

position it is connected in series with a 2½-c.p. lamp for 135-150 volts; in the latter case only the small lamp becomes incandescent, giving a white light. Instead of the 2½-c.p. lamp an 8-c.p. 240-volt lamp can be used, giving a subdued orange light, or other combinations can be made. The third degree of lighting is obtained with the switch in the "off" position, and is still more restful to the eye.

The voltage of the larger lamp, of course, must always be that of the local supply mains.

The ordinary Auto-Claw switch, we understand, is now made in the flush pattern as well as the tumbler type.

Smith's Patent Fittings.

Messrs. J. F. Smith & Co., of 10 and 12, Edmund Street, Birmingham, by their patent duplex switches claim to have effected a great simplification of switch wiring for electric lighting. These switches are placed in the brass body parts upon electroliers, brackets, balance weights and standards. From the centre of a compound lever upon the switch a small brass rod is taken through a tube to the bottom of the fitting for actuating one or any number of lights as required, by turning the switch-handle connected upon the rod mentioned. It is claimed also that instead of using the ordinary system of switchboards, with ordinary tumbler switches placed upon them, the duplex switch will meet all requirements. If a six-way is required, the space required is only 3 to 4 in. over-all and the switch is placed under a fancy cover, the circuits being actuated as required by one knob or thumb turn which is placed in the centre. These are made to any number of ways as desired, also for corridor two-way switch requirements.

The firm's system of wiring is to take one pair of wires into a room or rooms, pass one pole through the switch in the ordinary way to the light, and the other direct to the same position. After the wires are placed in position, they are passed down the tube of the electrolier to their respective terminals, positive and negative, provided in the patent duplex switch.

The connections are as follows:—From the negative terminal as many wires are taken as there are lights, direct to the lampholder positions. From the positive terminal the compound lever is connected, which passes current through the switches as they are wanted; from the switch terminals one wire is taken direct to each light or lights as required. To avoid walking into the room in darkness, as soon as the switch placed by the door is closed, one light upon the fitting is brought into action. The system is specially applicable for mansions, churches, hospitals, hotels and other public institutions.

Union Arc Lamps and Motors.

The Union Electric Co., Ltd., of Park Street, Southwark, S.E., has recently been busily engaged in moving into new and much larger premises at the above address, and its new showroom is, therefore, not yet in order. Nevertheless, preparations are being made for a large business in the coming lighting season, and a very large stock of "Excello" arc lamps will be carried ready for immediate delivery, of both A.C. and D.C. types. New and improved transformers and resistances will also be available. The chief novelty forthcoming from this quarter at the moment is the "Kohinoor" arc lamp, a type which is intermediate between the open and closed types. This lamp burns with a very small current, four or five amperes, with the high efficiency of an open white-arc lamp, and while the length of the lamp is only 20 in. over-all, the carbons burn from 30 to 40 hours, the exact duration depending on the kind of carbon, the strength of current, &c., that may be employed. The lamp will be suitable for lighting the interiors of shops, offices, &c., and for the exterior of low shop windows.

The company has also a patent "Ideal" system for shop window lighting, in which the source of light and the mechanism by which it is regulated are entirely concealed. The shop window is provided with a luminous ceiling, and the goods are intensely illuminated.

We have received the company's new price list No. 1,004 of D.C. motors and dynamos, characterised by the title "D.E.W." (Durability, Efficiency and Workmanship); these range from 3½ to 30 B.H.P. and 3 to 25 K.W., and the motors are made either "open protected" or "enclosed, ventilated and protected." A new list of their open type pure carbon arc lamps for direct current (No. 1,302) has also just been issued.

Prometheus Heating Apparatus.

The British Prometheus Co., Ltd., of Birmingham, have now issued their promised catalogue of new designs of electric convectors and radiators. In the course of some 44 pages there are a number of excellent designs of illuminated convectors for service

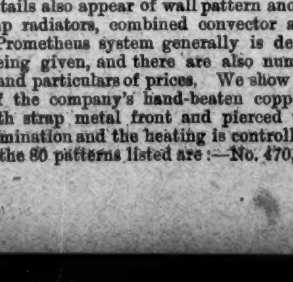


Fig. 94.—Prometheus Copper Antique Finish Convector.

in private residences and public buildings, also for ship use; illustrations and details also appear of wall pattern and tramcar convectors, glow lamp radiators, combined convector and radiator, and so on. The Prometheus system generally is described, working instructions being given, and there are also numerical and code-word indexes, and particulars of prices. We show the No. 467 type, which is one of the company's hand-beaten copper antique finish convectors, with strap metal front and pierced top. It is fitted with ruby illumination and the heating is controlled by one switch. Others among the 80 patterns listed are:—No. 470, which is a hand-

some hand-beaten brass convector, relieved with *repoussé* work, having a pierced design on the top of the heater. In this pattern the heating is controlled by two sunk switches, and the ruby illumination by another switch. No. 468 is a different type of convector, the body being of very fine cast bronze. No. 473 is an ornamental four-lamp radiator in armour bright iron, complete with polished copper reflector and four lamps. The heating lamps used in Prometheus radiators and also the ruby lamps in their convectors are of "Ediswan" manufacture. The company are able to give prompt delivery of the patterns illustrated in the list.

CONTRACTS OPEN and CLOSED.

OPEN.

Beckenham.—October 29th. Induced draught apparatus for the U.D.C. electricity and destructor works. See "Official Notices" October 5th.

Cleckheaton.—October 29th. One 82-KW. motor-generator with switchboard and accessories for the Council. See "Official Notices" to-day.

Erith.—October 29th. Water tank, water-purifying and softening plant, feed pump and pipework; removal and re-erection of existing condensers, feed pumps, pipework, &c. See "Official Notices" October 12th.

G.W. Railway.—October 29th. Stores for one year. See "Official Notices" October 12th.

Hungary.—November 15th. The municipal authorities of Veszprem are inviting tenders for the establishment of a central electric lighting station in the town.

Italy.—October 23rd. The General Direction of the Arsenal at Spezia is inviting tenders until the 23rd inst. for the supply of a large quantity of electrical cable and wire.

Llandaff and Dinas Powis.—October 23rd. The Council invites separate tenders for telephones and electric bells required at their Infectious Diseases Hospital, now in course of erection at Caerau, near Cardiff. Specifications on application to Mr. J. H. James, M.S.A., Albert Chambers, High Street, Cardiff.

London.—November 5th. Sundry fittings and stores for the L.C.C. See "Official Notices" to-day.

Manchester.—October 31st. One 5,000-KW. turbo-alternator complete with condensing plant, for the Corporation. See "Official Notices" October 5th.

Northampton.—October 29th. 1,500 tons of steam coal for the Corporation. See "Official Notices" to-day.

Pontypridd.—October 22nd. Cables for the U.D.C. See "Official Notices" October 12th.

Portsmouth.—November 5th. Electric pumping, &c., plant in connection with the works for the prevention of storm water flooding at Southsea. See "Official Notices" October 12th.

Spain.—October 29th. The municipal authorities of Linares (province of Jaen) are inviting tenders until the 29th inst. for the concession for the electric lighting of the town during a period of 12 years. Particulars may be obtained from, and tenders are to be sent to, El Secretario del Ayuntamiento de Linares (Jaen).

Spain.—The municipal authorities of Ayora (Valencia) have just invited tenders for the concession for the electric lighting of the town during a period of 20 years.

Spain.—November 3rd. The Government invites tenders as follows:—For (1) an electric tramway in Barcelona, starting in the Calle Dalmesses, and passing through the following streets: Ganduxe, Cortes, Negrovernis, and ending in the Copernico and Muntane Streets; and (2) for the concession to construct and work an electric tramway in Barcelona, from Escorial to Fuente Castellana Street, passing through the Plaza (Square) Josepets. Particulars may be obtained by registered letter from the Direccion General de Obras Publicas, Ministerio de Fomenta, Madrid. Local representation is required.

Swinton and Pendlebury.—November 3rd. Substation buildings, low tension switchboard, mains, and meters for the U.D.C. See "Official Notices" to-day.

CLOSED.

Epsom.—The U.D.C. on October 10th accepted the following tenders:—

Browett, Lindley & Co., Ltd.—Improved three-crank triple-expansion forced lubrication engine, and Electric Construction Co.'s dynamo, £1,730.
Stirling Boiler Co.—Water-tube boiler and pipe-work, £962.
Wheeler Condenser & Engineering Co.—Surface condenser, combined with air and circulating pumps, £419.
Musgrave & Co., Ltd.—Induced draught fan, £80.

Germany.—Messrs. E. Becker & Co., of Rheineckendorf, near Berlin, have secured a contract for 18 electric cranes for the Hamburg Harbour authorities.

London.—BERMONDSEY.—The B.C. has received the following tenders for cable:—

Johnson & Phillips (accepted for 1 and 2).—(1) 120 yards ·125 triple-concentric cable, £47 11s.; (2) 250 yards ·5 triple-concentric cable, £299 7s. 4d.; (3) 49 yards ·5 single rubber cable, £33 10s. 11d.
British Insulated & Helsby Cables.—(1) £47 11s.; (2) £309 16s.; (3) £33 11s.
St. Helens Cable Co.—(1) £47 11s.; (2) £299 13s. 2d.
Siemens Bros. & Co. (accepted for 3).—(1) £47 11s.; (2) £299 13s. 3d.; (3) £31 13s. 3d.
W. T. Glover & Co.—(1) £47 11s.; (2) £299 13s. 2d.; (3) £33 10s. 11d.
Callender's Cable Co.—(1) £48 1s. 6d.; (2) £304.

SOUTHWARK.—The B.C. has accepted the tender of Spenser, Whatley, Ltd., for the supply of 5,000 tons of West Hallam and Griff coal, at 12s. 11d. and 11s. 11d. per ton respectively, delivered at the electricity works, Penrose Street. There were 29 tenders.

L.C.C.—The Highways Committee of the L.C.C. has received the following tenders from selected firms for the supply of motors needed for the conversion of two generators, which are to be removed from the station at Loughborough Junction to that at the Elephant and Castle, into motor-generators:—

Dick, Kerr & Co.	(accepted)	£7,100
British Westinghouse Co.		8,177
Siemens Bros.' Dynamo Works		8,428

The offer of the South London Electric Supply Corporation, amounting to £900, has been accepted for the purchase of the two L.C.C. boilers installed on the company's premises at Loughborough Junction.

Lowestoft.—The T.C. has accepted the tender of Messrs. Duckham & Co., Millwall, for the supply of one ton of compound for the mains, at £29.

Margate.—The T.C. received the following tenders for installing E.L. plant at the Wingham Water Works:—

Kingston & Co., Ltd., Margate (Recommended for acceptance) ..	£335
Nursey & Marr, Westminster	310
G. H. Chard & Co., Oxford Circus, London	335
Sturton & Waters, Margate	336
Jackman & Marchant, Folkestone	339
Strange & Sons, Ltd., Tunbridge Wells	339
Hill, Upton & Co., Oxford	343
C. Pullan, Bradford	346
Webster & Son, Folkestone	358
R. Cort & Son, London	362
E. J. Philpott, Canterbury	365
W. H. Arundel, Maidenhead	366
E. Newbald & Co., Sutton, Surrey	381
Middleton & Winstanley, Dover	385
L. T. Young & Co., Dover	390
R. Woods & Co., Westminster	398
Thames Iron Works Co.	410
Bramley & Co., Ilford	451
A. H. Marshall & Co., Leytonstone	500

Rochester.—The T.C. has accepted the tender of Messrs. Wenham & Waters, Ltd., Croydon, for installing the electric light in the Technical Institute, at £142.

Surbiton.—The U.D.C. has accepted the tender of Messrs. Macdonald Bros., of Surbiton, for the erection of a power station, at £1,294.

Sunderland.—The T.C. on the 10th inst. accepted the Electricity and Lighting Committee's recommendation concerning the acceptance of tenders as follows:—

Alfred Tully, for wiring Hylton Road electric lighting station (extension building).
Belliss & Morcom, Ltd., a new steam alternator for the Hylton Road electric lighting station.
H. A. Davie, Ltd., for fixing chequer plating and hand-railing at Hylton Road electric lighting station.

Walsall.—The T.C. has accepted the tender of Messrs. Bolckow, Vaughan & Co. for the supply of steel tram rails.

Wolverhampton.—The T.C. has accepted the tender of Messrs. Glover & Co. for the supply of cables.

Woolwich Arsenal.—The Underfeed Stoker Co., Ltd., have received from H.M. War Office an order for the equipment, with their type "E" stoker, of four Babcock & Wilcox boilers for the new central power station at Woolwich Arsenal.

FORTHCOMING EVENTS.

To-day's Events (Friday, October 19th).—Northampton Institute Engineering Society. Presidential address by Dr. R. Mullineux Walmsley. Messrs. S. M. Hills and W. Chappell on "Reciprocating Engines *v.* Steam Turbines."

At 7.30 p.m. I.E.E. (Glasgow Students). At Glasgow and West of Scotland Technical College. Prof. Magnus Maclean (chairman of the Students' Section) will open the session with a paper on "Electrical Wave Measurements."

At 8 p.m.—I.Mech.E. First general meeting of session. Resumed discussion on "Railway Motor-Car Traffic," by Messrs. T. H. Riches and S. B. Haslam. Mr. E. M. Hann on "Some Notes on the Mechanical Equipment of Collieries."

Saturday, October 20th.—At 2.45 p.m. N.E. Coast Institution of Engineers and Shipbuilders (Graduates). Visit to Messrs. Palmers' Shipbuilding and Iron Co.'s works.

Thursday, October 25th.—Opening meeting of the Leeds Section of the I.E.E.

Friday, October 26th.—At 7.30 p.m. N.E. Coast Institution of Engineers and Shipbuilders. At Westgate Road, Newcastle-on-Tyne. Presidential Address by Mr. W. H. Dugdale.

THE ELECTRICAL ENGINEERS R.E. (VOLS.).

The following orders are issued:—

Monday, October 22nd.—"A" Company. Meeting at 8 p.m.

Tuesday, October 23rd.—"B" Company. Meeting at 8 p.m.

Thursday, October 25th.—"C" Company. Meeting at 8 p.m.

Friday, October 26th.—"D" Company. Meeting at 7.45 p.m.

J. H. S. Phillips, Captain E.E.,
For O.C.E.E.R.E. (V.).

NOTES.

Patents and Prejudice.—With reference to the letter from Mr. G. Byng appearing in our "Correspondence" pages this week (p. 608), we ought to say that Sir Joseph Lawrence, having received an intimation from Mr. Byng that he had written this communication to us, has left with us Mr. Byng's original letter to him upon which he (Sir Joseph) founded the arguments used by him in the article which we ventured to criticise last week. We have searchingly examined Mr. Byng's letter to Sir Joseph, and we fail to find therein the statements as now quoted by Mr. Byng in inverted commas. We however, do find the following:—

"The amount first paid to foreign companies for apparatus which could have been made in this country with the greatest ease I compute at at least £10,000,000 sterling, but this is not the worst. . . . If I compute all the money which has been spent by the National Telephone Co. and by our English and Colonial Governments,* from the beginning of the telephone industry in 1880 up to the present time, I believe the amount would be at least £30,000,000 sterling."

Sir Joseph has signified his intention of pursuing this matter further himself in our next issue.

Cooking by Electricity in the Army.—The *Tribune* says that great interest is taken at the War Office over the adoption by the United States Army of an electrical cooker. It has four compartments, and weighs when empty 120 lb. It will hold 20 gallons of food, enough to supply a meal to a company of infantry or a troop of cavalry. The head of the Commissary Department of the United States Army, General Sharp, says that the cooker was constantly employed this summer when the troops at the various encampments were sent out on a march or to bivouac for the night, in preparation for manœuvres the next day. On outpost duty the troops have found the cookers invaluable.

Municipal Expenditure.—According to the Blue Book which has been issued this week relating to local taxation during the year 1903-4, loans were raised by municipal authorities for £2,879,697 for tramways and light railways, and by town councils £2,868,076 for electric lighting undertakings. These figures do not include whatever was expended in London. The total municipal indebtedness of the country, excluding London, is given as £219,909,343.

Electric Supply Cricket League.—We are asked to announce that the annual general meeting of this League takes place at the offices of the St. James' and Pall Mall Electric Lighting Co., 19, Carnaby Street, Golden Square, W., on Tuesday, October 30th next, at 7 p.m. Any clubs interested are requested to send a representative to the meeting. The hon. sec., Mr. A. W. Seabright, 19, Cadogan Gardens, S.W., will be pleased to furnish them with any information that may be desired. The points scored by the affiliated clubs during last season were as below. It will be seen that the St. Pancras Borough Council Electricity Cricket Club are the winners of the Challenge Cup:—

St. Pancras Borough Council Electricity C.C. ...	10 points.
Chelsea Electricity C.C.	9 "
St. James' Electric C.C.	4 "
Charing Cross Electric C.C.	1 "

Westminster Electric C.C. did not compete.

Zone Patents.—The following letter has come to hand on this subject too late for insertion in our "Correspondence" columns:—

"The letter from Mr. Hickley, in your last issue, on the subject of the 'Zone' patent, comes as a surprise to me. Mr. Hickley has no doubt forgotten the facts as to my patent being the original patent for the 'Zone' motor, but as his letter is a direct contradiction of my statement, I have no alternative but to take up his challenge, and show my authority and right as inventor and patentee of the 'Zone' electric motor.

"The 'Zone' Dynamo and Motor Patents Co., Ltd., own a group of patents which embody the principles and construction of the 'Zone' system, as follows:—

"1. Henry F. Joel.—No. 13,036, July 19th, 1900, also patented in Germany June 5th, 1901, No. 6J6252 VIII/21d; and U.S., America, August 13th, 1901, No. 680,597, as well as other countries.

"2. J. St. Hill Mawdsley, No. 6,666, March 18th, 1902.

"3. J. St. Hill Mawdsley, No. 9,604, April 28th, 1903.

"4. John H. Holmes, No. 20,606, September 25th, 1903.

"5. J. St. Hill Mawdsley, No. 21,972, October 12th, 1903.

"My patent, as above, is the original and pioneer patent for the 'Zone' winding; in the specification of No. 13,036 (1900), page 4, the words 'neutral zone' occur several times, and the name of the company was suggested by these words. The principle of the 'Zone' winding is described on page 5 of this specification, lines 9 to 10, 'in my method the coil passes between successive pairs of poles,' and lines 33 to 35, 'the field coil is wound to follow, or to trend in the same direction as the armature winding'; and lines 40 to 42, 'my field coil winding rather assists to magnetise the armature with the same polarity as is induced by the field poles, and prevents disturbance and sparking.' These extracts, in brief, clearly describe the 'Zone' system and winding and must be read and accepted in a broad sense. At the time of that patent in 1900, the exact definition of reactance voltage in the armature coils undergoing commutation was not determined by Dr. Max Breslauer and other scientists, and the saving in magnetic leakage, avoidance of distortion, and the directly energising the armature were also new, and I therefore take full credit for the advantages of reduction of reactance voltage, and other features as above, now more fully investigated and proved to accompany the placing the field coil close to, and directly over, the neutral Zone of the armature. Your readers will remember the very full description of the Zone system which appeared in the Review, August 5th and 12th, 1904, and can judge for themselves whether the extracts I have quoted from my specification do cover the principle of the "Zone" winding.

"The question of priority of the patents is a question of date, and my patent is over 18 months before the patent of Messrs. Newton's chief electrician. The question of identity was thrashed out in the court before Sir Edward Carson, who was then Solicitor-General, and the patent No. 6,666—1902, was only allowed on condition that a specific reference to my patent was inserted therein; this was done (see page 4, lines 28 to 30, of that patent).

"It is interesting to note that on page 1, lines 20 to 24, of patent No. 6,666—the words 'Further, I am of opinion, from theoretical considerations, that the construction described whereby a portion of the field coil is placed just over the armature coil undergoing commutation will conduce to sparkless collection at the brushes of the machine, but I have not yet verified this experimentally'—and the words 'neutral zones' are also used in this specification.

"The patent No. 6,666 is a perfectly good patent as an addition, or supplementary, to my patent, and after the decision of the Solicitor-General, it was felt to be desirable in the interests of both patentees, to combine them, and the Zone Co. was formed for this purpose, to the advantage and strengthening of both. Mr. Hickley has evidently forgotten that he was chiefly instrumental in effecting this combination.

"The Zone Co. also acquired the valuable patent of Mr. John H. Holmes, for improvements in construction, as well as Mr. Mawdsley's subsequent patents. The whole group in combination fully covers the principles and construction of the 'Zone' motors, the advantages of which have been fully proved, and are becoming of more and more value.

"Henry F. Joel.

"London, W.C., *October 16th*, 1906."

American Views of British Employers.—After the wonderful things we have been told in the past about the conditions that prevail in connection with some of the show factories of the United States—where the dream of living in marble halls has been realised in the lavatories, at least—it is rather amusing, and a little gratifying, to read an article by "An American Expert on Welfare Work," which appeared a short time ago in the *Business Man's Magazine*. The author states that "long before the Americans tried the welfare work of to-day, the English and Continental villages and communities were solving many problems of relationships"; and, again, that "European employers seem to recognise their responsibility for the workman's family more than

* Mr. Byng now says "world trade."

do Americans." Mr. E. L. Shuey, who writes the article, attributes these facts to the circumstance that many great industries in Europe belong to one individual or family, and not to anonymous companies, to adopt the French phrase; and in this he is no doubt tolerably correct. Mr. Shuey also remarks that attempts to improve the working man's daily life have come very largely from the employers, not from requests or demands made by the men themselves, who appear to have exhibited a lack of initiative in the matter. As we have heard so much lately about employers who have just conceived the idea of founding a model village for their hands, or a workman's institute for recreation or culture, Mr. Shuey does good service in pointing out that the notion is not new. One of the pioneers was Sir Titus Salt, who founded the village of Saltaire in 1853; but our author omits to mention the Frenchman Fourier and his "Phalanstery." Although he admits that the element of "paternalism" is reduced as much as possible in these villages, Mr. Shuey questions whether American workmen would be satisfied with many features of the scheme; but he regards as most admirable the encouragement that is sometimes extended to the men to purchase their own houses. It must be confessed that an illustration appended to the article, showing a dining-room for girls, in an English workman's institute, has a distinctly repellant aspect, suggesting a kind of barrack life devoid of all privacy, and destructive of individuality.

Mr. Shuey states that the employment of married women and mothers is not encouraged in the States; but since the system obtains with us, he commends the plan adopted in certain factories of letting the wives and housekeepers go home before the rest of the hands without loss of pay, so that the meal may be ready for the household. He adds that "loyalty to his country, defence of its honour and obedience to its laws are prominent even in great factories—particularly in Great Britain." We cannot help regretting that Mr. Shuey has refrained from telling us where this beautiful state of affairs is to be seen. The sports subsidised or encouraged by employers come in for a few words of favourable recognition, as do the companies of volunteers recruited from single factories, where the men are paid their ordinary wages when in camp, and when drilling for an hour each week. Finally, Mr. Shuey refers to technical education and evening classes, singling out for mention one firm which pays the fees of all boys and girls who attend 60 per cent. of the classes each term, and gives prizes for excellence in addition.

Appointments Vacant.—Switchboard attendant for Paisley (£1); mains assistant for York electricity department (35s.); storekeeper and assistant clerk for the Wimbledon electricity department (32s. 6d.); the Islington Lighting Committee propose to advertise for a chief assistant engineer with practical and commercial experience of an electrical undertaking at a commencing salary of £250 per annum, rising by annual increments of £25, to a maximum of £330.

The Pecuniary Value of Technical Education in the States.—In the course of an address delivered a short time ago by Mr. James M. Dodge, formerly President of the American Society of Mechanical Engineers, the speaker stated that the average annual salary of the technically trained man in the United States was over $2,150, while that of the non-technical but trade-trained man was only $790. This shows a gain in average annual income due to technical training of over $1,360, which, capitalised at 4 per cent., is $34,000. The matter was referred to by Mr. Charles G. Washburn, President of the Corporation of the Worcester Polytechnic Institute, in the course of his commencement address delivered last summer. Mr. Washburn remarked that Mr. Dodge's calculations were borne out by the experiences of the graduates from the Worcester Institute; and he added that inasmuch as there were over a thousand living graduates from this one educational establishment in the States, the work done there, at its lowest computation and measured in terms of money only, had already a capitalised value of over $34,000,000, without any allowance for the pecuniary value of the enterprises directed or initiated by the graduates in question. Other examples of the service rendered to the community by an institution affording technical education were quoted by Mr. Washburn. For instance, in the city of Worcester (U.S.) there are now engaged in active life 173 graduates of the Polytechnic Institute, whose conjoint labours are equal to a capitalisation, on the above estimate, of $8,750,000. But the total value of the real and personal property of the Institute is only $1,300,000, $1,000,000 of which was contributed by the citizens. The present cost of training students at Worcester amounts to about $300 annually; but the Institute undertakes to teach 40 students free on consideration of receiving an annual payment from the State equal to $250 per head, and also educates over a hundred Worcester boys at the regular tuition fee of $160 per head. The Worcester Polytechnic Institute was founded in the year 1865, and at first gave technical instruction of the ordinary kind and training in workshop operations, the shop being run on commercial lines, and the articles made therein sold on the open market, which, Mr. Washburn observed, was a unique arrangement.

Opening of the Muspratt Laboratory at Liverpool.—The new Muspratt Laboratory of Physical and Electro-Chemistry, at University College, Liverpool, which was recently described in the ELECTRICAL REVIEW, was formally opened by Sir William Ramsay, K.C.B., F.R.S., on Saturday afternoon last. The opening ceremony took place in the Arts Theatre of the University, before a large and distinguished assemblage. In the absence of the Earl of Derby (Chancellor of the University), Dr. Dale (Vice-Chancellor) presided. The Vice-Chancellor welcomed the visitors, and spoke of the influence of occasions of the kind as strengthening the spirit of brotherhood and unity. Mr. E. K. Muspratt spoke of the progress of chemistry, and of the important part which physical chemistry was destined to play in the future. He closed his address by asking the Vice-Chancellor to accept the gift of the new laboratory as an addition to the University.

The Vice-Chancellor accepted the gift, and alluded in warm terms to the generosity of the donor. A gold key of the building was presented to Sir William Ramsay, as a memento of the occasion.

Sir William Ramsay spoke first of specialisation; then of the need of cultivating the higher and the thinking faculties; and then on the great theme, chemistry. He alluded to the blessings which, through chemistry, had come to mankind, and he doubted not that blessings would fall upon the laboratory, its teachers and its students in time to come.

Sir John Brunner proposed a vote of thanks to Sir Wm. Ramsay. Prof. F. G. Donnan seconded, and the vote was passed with great heartiness.

In the evening Mr. Muspratt, and many of the visitors who had attended the opening of the laboratory in the afternoon, were entertained to dinner by the Liverpool Section of the Society of Chemical Industry, at the University Club, Renshaw Street. Dr. J. T. Conroy, chairman of the Section, presided.

Fire.—On 9th inst. damage by fire to the extent of about £50,000 was done at the Merchant Venturers' Technical College, Bristol. The City Council is placing various public buildings at the disposal of the authorities for the accommodation of the students.

Institution and Lecture Notes.—GLASGOW TECHNICAL COLLEGE SCIENTIFIC SOCIETY.—The opening meeting of the fifteenth session is to be held to-morrow at the Grosvenor Restaurant, Gordon Street, Glasgow, when Mr. W. W. Lackie will deliver his presidential address. The retiring president (Mr. R. D. Munro) will preside. The following is the list of arrangements for the session:—

October 20th.—Presidential Address by W. W. Lackie, M.I.E.E.
October 27th.—"Some Rival Steam Engine Theories," by A. L. Mellanby, D.Sc., M.I.Mech.E.
November 10th.—"Producer Gas Plant," by F. J. Rowan, A.M.I.C.E., M.I.E.S.
November 24th.—"1876 to 1906—A Review of Destructor Practice," by W. Francis Goodrich, A.I.Mech.E., F.I.S.E.
December 8th.—"Newspaper Printing Plant," by David Carlaw, junr.
December 15th.—Fifteenth Anniversary Dinner.
January 19th, 1907.—"The Development of the Alternating-Current Motor," by W. Benison Hird, M.A., M.I.E.E.
February 2nd.—"Mechanical Refrigeration," by John Graham.
February 16th.—"The State and the Inventor," by B. H. Thwaite, C.E.
March 2nd.—"Balancing of Marine Engines," by F. V. Robinson, Wh.Sc., A.M.I.Mech.E.
March 16th.—"The Spectrum: Visible and Invisible," by Angus M'Lean, B.Sc. (London).
March 30th.—Annual General Meeting.

A series of scientific lectures has been arranged to be given to the Glasgow Corporation workshops staff at Coplawhill during the winter. Amongst the lecturers are Mr. T. C. Fulton, Prof. Alex. Humboldt Sexton, Prof. Magnus Maclean and Mr. P. D. Ionides. The opening lecture was given on Friday night last by the general manager of the tramways, Mr. James Dalrymple, his subject being "Tramways in Glasgow and Elsewhere."

THE JUNIOR INSTITUTION OF ENGINEERS.—On Saturday afternoon last, a visit was paid by this Institution to the Engineering and Machinery Exhibition at Olympia. On the arrival of the visitors, nearly 150 in number, divisions were formed, and Dr. H. S. Hele-Shaw, F.R.S., Mr. J. H. R. Whimfield, A.M.Inst.C.E., and Mr. R. S. Hindle, A.M.I.Mech.E., and other gentlemen acted as guides.

Mr. C. H. Yeaman, borough electrical engineer at Hanley, recently commenced a series of lectures on "Electrical Engineering" under the auspices of the Hanley Education Committee. The first lecture, delivered on October 1st, was entitled "The Production and Generation of Electricity"; and the subject of the second was "The Transmission and Distribution of Electricity."

Labour Troubles.—According to the *Times* of October 12th, a threatening state of affairs exists in Sheffield in connection with an application made by the moulders for an advance of wages from 40s. to 42s. per week. The men number fully 1,200, and as a great portion of the engineering trade of the city is dependent on their work, a strike would have a very serious result. At present a deadlock appears to have been reached, and both sides seem determined not to give way. The men's contention is that the state of trade warrants them in applying for the advance, but the masters are by no means ready to admit this, and they also maintain that if they do grant any concession the men should agree in return to different conditions of working. One firm in the city—Hadfield's Steel Foundry Co., Ltd.—has taken independent action in the matter, and granted the advance asked for, but this is the only instance in which a settlement has been arrived at.

The *Standard* says that a conference held on 11th inst. between engineering employers on the north-east coast and the allied engineering trades resulted in a refusal, for the second time, of the men's demand for an advance of 5 per cent. in piece rates and 2s. per week in time rates.

Gas.—Two ladies were found dead in a house at Acton on 12th inst., having been suffocated by gas. Gas had been leaking heavily from the gasolier, which had been insufficiently filled with water.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Engineers.—At a meeting of the Sunderland T.C. on 10th inst., Mr. G. S. Lawson moved that the resolution passed at the previous meeting, confirming the appointment of Mr. A. A. Day, of Bolton, as electrical engineer of the borough, be rescinded. He pointed out that it was decided, when they advertised, that one of the conditions of the appointment should be that the candidates should not exceed the age of 40. That was plainly stated in the advertisements of the vacancy, and in his application Mr. Day said he was 40, and claimed to have fulfilled the conditions mentioned in the advertisements. When Mr. Day was before the Committee, it was pointed out by a member that as Mr. Day's age was given as 40, he did not meet the age requirements, but the chairman ruled that out of order. If Mr. Day had said that his age was 41, he (Mr. Lawson) said it would have received summary treatment at the hands of the Committee. When the five gentlemen left for final selection were before the Committee, there were doubts expressed as to Mr. Day's age, which, judging by appearance, was over 40. Mr. Lawson said he thought so, and took upon himself to ascertain Mr. Day's age. Mr. Day was finally selected for recommendation two days before the appointment came before the Council for confirmation, so that he (the speaker) had not time to get the facts to lay before that meeting. He had, in the meantime, taken steps to ascertain Mr. Day's age, and had secured a copy of his birth certificate, which showed that he was born on May 10th, 1864. Therefore, when he sent in his application to the Council his age was 42 years and three months, and not 40 years. When he learned this Mr. Lawson saw the chairman of the Electricity Committee, and showed him the certificate, and at the next meeting of the Committee, Alderman Bruce, the chairman, brought the matter forward. The town clerk having in the meantime written to Mr. Day pointing out this fact, Mr. Day's reply was submitted to the meeting, and was to the effect that he (Mr. Day) was surprised to find that he was more than 40 years of age, and that when he applied for the appointment he held at Bolton, where there was no age limit, he gave a corresponding age to the one given in his application to the Sunderland Corporation. Mr. Day said he was sorry, and said he appeared to have been labouring under a mistake. The crux of the question was: Did Mr. Day know, or have reasonable grounds to believe, he was 42 years and three months old when he stated in his application that he was 40 years of age? He (Mr. Lawson) submitted that he had ample evidence, and he must have known that his age was 42. Mr. Lawson explained how he had obtained other dates of occasions when Mr. Day had given his age, and these, the speaker urged, bore out his contention. Mr. Ritson seconded the motion. Alderman Bruce said that he was exceedingly sorry for what had happened. He was not going to defend the man if he thought Mr. Day had acted wilfully in stating the age he did, but he asked them not to rescind the resolution, the result of which would be to convict Mr. Day of having wilfully and deliberately falsified a statement of his age. Mr. Day had splendid testimonials. The speaker asked the Council to give Mr. Day the benefit of the doubt and say he was labouring under a mistake, rather than damn his professional career. After further discussion the motion was carried by 46 votes against 1. Several councillors remained neutral. It is stated in a Manchester paper that Mr. Day had not resigned his position as electrical engineer at Bolton, his resignation only applying to his position as traffic manager of the tramways, the duties of which he undertook without extra salary on the resignation of Mr. Howard. On Tuesday the Corporation Electricity Committee decided by 11 votes to 5 to recommend the appointment of Mr. Blackman, of Bradford, for the position.

Mr. William Shorter, of Windsor Electricity Works has been appointed as junior electrician-in-charge at the Hornsey Electricity Works.

The Burslem T.C. has increased the salary of Mr. H. W. Edwards, shift engineer, from £104 to £130 per annum.

The Huddersfield T.C. has been recommended to increase the salary of Mr. A. B. Mountain, electrical engineer, from £450 to £600 per annum by three annual instalments of £50, from August 14th last.

Mr. J. R. S. Barkshire has resigned the position of senior engineer-in-charge, which he holds at present with the Durham Collieries Electrical Power Co., owing to ill-health.

Tramway Officials.—For the post of tramway traffic superintendent, the Ilford U.D.C. has received 98 applications. The salary is £200 a year.

General.—Last Friday Mr. C. Henson was presented by his friends at the B.T.-H. Co., Rugby, with a marble timepiece, suitably inscribed, on the occasion of his leaving Rugby to take up a position with the Sneyd Collieries, Ltd.

Mr. John Young, formerly manager of the Glasgow Corporation Tramways, and latterly manager to the late Mr. Yerkes in his London electric railway enterprises, has joined the board of directors of the Paisley District Tramways Co.

Mr. Cecil B. Smith, consulting electrical engineer, of Toronto, and chairman of the Ontario Hydro-Electric Commission, has been appointed engineer-in-charge of Winnipeg's municipal power scheme. His salary has been fixed at $5,000 a year, and Mr. Smith will be expected to devote half his time to his Winnipeg duties, and will have a board of consulting engineers to assist him.

Obituary.—By the death of Sir Richard Tangye, which occurred on the 14th inst., at the age of 73 years, British engineering industry has lost one of its foremost representatives—a man, who by the exercise of ingenuity, enterprise, and close application to industry, and by getting abroad into intimate touch with some of our Colonial markets, built up, with the aid of his brothers, the world-renowned firm and business which bears his name at Birmingham.

The death occurred on October 12th, at his residence at 10, Bedford Square, of Mr. Stefano Gatti, a director of the Charing Cross and City Electric Co., Ltd., and managing director of the Charing Cross, West End and City Electricity Supply Co., Ltd. He was in his 62nd year.

NEW COMPANIES REGISTERED.

General Electric Sign and Engineering Co., Ltd. (90,297.)—This company was registered on September 29th, with a capital of £2,000 in £1 shares, to carry on in England or elsewhere the business of general engineers and contractors, manufacturers of signs and electrical apparatus, machinery, tools, smallwares in metal, wood or other materials, mechanical and other appliances and apparatus, &c. The first subscribers (each with one share) are:—G. Morris, Sacchino, Maze Road, Kew, chartered accountant; R. Herbing, 4, Dean Road, Hounslow, clerk; E. Hayes, 4, Grosvenor Gardens, Muswell Hill, N., chartered accountant; H. Phillips, 44, Lawrie Park Road, Sydenham, S.E., clerk; G. W. Puttnam, 56, Mildmay Street, Islington, N., engineer; J. Mitchelly, 22, Twickenham Road, Leyton, clerk; and H. Pite, 111, Clarence Road, Lower Clapton, N.E., clerk. No initial public issue. The number of directors is not to be more than five; the subscribers are to appoint the first; no qualification necessary; remuneration as fixed by the company.

CITY NOTES.

Monte Video Telephone Co., Ltd.

The annual ordinary general meeting of the above company was held on Monday, at Winchester House, E.C., Mr. Frank W. Jones (chairman and managing director) presiding.

In moving the adoption of the report, the Chairman said that at the last annual meeting he told them of the steady increase of their net profits since the rearrangement of the capital of the company in 1898—an increase from £6,826 to £15,475. For the past year they were able to show a still higher figure, viz., £17,994, an increase in net profits in eight years of over 150 per cent., which he fairly thought might be considered very satisfactory. The capital expenditure for the year, which was considerably more than for the previous one, had again been met out of revenue, and the company remained not only practically free from debt, but with a very substantial amount of liquid assets in hand. It had been hoped that before this they would have been able to announce an arrangement with the National Government and with the municipality that would have assured an early placing of an underground plant in Monte Video, which for a number of years they had been trying to effect, and while they were hopeful that such an arrangement would not be long delayed, its utility, in fact, its necessity, had not thus far become so apparent to the authorities as had been the case in the neighbouring Republic of Argentina. The advisability of any underground plant from every point of view must be recognised before very long, and they constantly had in mind the considerable expenditure it would then be necessary to incur. He indicated a year ago that an increased dividend might reasonably be expected, and that prophecy had been fully verified. They were able, after paying the dividend on the preferred shares, to recommend a final dividend on the ordinary shares of 3 per cent., making 5 per cent. for the year. They placed the same to reserve fund as last year—£5,000, £4,000 to the reserve for the renewal of plant, which was £1,000 more than last year, and carried forward £2,383, a slightly increased amount. They could now hold that their shares were on a fairly remunerative basis, and they might confidently look forward to their becoming of greater value. Monte Video was growing and improving constantly, and with its growth and improvement both the number of subscribers and their revenue must increase.

Mr. Le Marchant seconded the motion, and the report was adopted.

Edison & Swan United Electric Light Co., Ltd.

The twenty-third ordinary general meeting of the shareholders of this company was held on Thursday of last week at Winchester House, Mr. Henry Wolfenden in the chair.

In proposing the adoption of the report, the Chairman said they might congratulate themselves on the continued improvement shown in the affairs of the company. The improvement, though slow, was steady, and, therefore, he thought more likely to be permanent. Moreover, they must remember that it had been attained in the face of active competition, which fact, he thought, spoke well for the solidity and vitality of the business. Some shareholders might, perhaps, consider that considering the circumstances they might have recommended the payment of a much larger dividend. On the face of the accounts a larger dividend could have been paid, and he need hardly say that the directors had given very careful attention to the matter, and they had unanimously come to the conclusion that for this year, at all events, the better policy was to recommend the dividend they now pro-

posed. It was progressive, it was conservative, and it promised expectations of an extension in the future. The further question of the payment of an interim dividend during the current financial year would be carefully considered at the proper time. Their volume of trade continued to show very satisfactory progress, and their thanks were due to their friends who had loyally supported them and whose interest they continuously studied both in price and quality. The net revenue account showed a balance of £53,709, an increase over the preceding year of £5,811. On the other side, debenture interest showed a decrease of £2,030, which was due to the redemption of stock. They had appropriated £11,000 for depreciation account for freehold and leasehold property, plant and tools, which was £1,000 less than the previous year, but still it was an ample figure, in their opinion. Stocks were written down by £1,507, in addition to a reserve fund of £1,069, which was the profit on the cancellation of debenture stock, and they thought they had valued their stock on conservative lines. They had hitherto provided by way of provision for further stock depreciation, £1,000 a year. That had been discontinued, as the board no longer considered it necessary. They had this year commenced the formation of a general reserve fund by the allocation thereto of a sum of £5,000, and he trusted that course would commend itself to the shareholders as a right and proper step. The net balance available for distribution was £18,150, and if they added the balance brought forward from the previous year of £6,834, they had a total of £24,985, out of which they proposed to pay 2s. 6d. per share on the part-paid shares, and 4s. 2d. on the fully paid shares, being at the rate of 4⅛ per cent. Those payments would absorb £15,978 and leave £9,006 to be carried forward. The Altrincham Co. was making steady progress. During the year they had reduced their debt to the Edison & Swan Co. on current account, and since the close of their financial year they had paid a dividend on their shares. It was true the amount was small—only 2 per cent.—but they had every reason to hope that the dividend during the coming year would amount to 4 or 5 per cent. after making adequate provision for reserve and depreciation. He regarded that concern as a steadily progressive one. In conclusion, the chairman said he thought he could repeat what he said last year, viz., that the company was attaining a stronger position every year.

Mr. E. B. Ellice-Clark seconded the motion, and the report was adopted.

Cuba Submarine Telegraph Co., Ltd.

Mr. C. W. Parish (chairman) presided at 58, Old Broad Street, on Wednesday, over the 70th ordinary general meeting of this company.

In moving the adoption of the report, the Chairman said he was glad to say the figures they were able to lay before them were better than those that they had had for some time. They would remember that of late when he had addressed them he had pointed out signs of development in various directions in the island of Cuba—an increase in the cultivation of tobacco, the extension of railways, and that kind of general movement in business which was bound to lead to further extension in all branches of commerce, amongst which telegraphic communication must largely figure. Hence they found their last half-year's receipts up to June 30th were £17,638, as compared with £14,811 in the previous year. He should add that their cables were not all working last year, which was against them, but, generally speaking, they could report a successful half-year's working. The cables had worked well, and communication had been efficiently and rapidly maintained. Reference was made in the report to the political rising which had recently taken place in the island. It was difficult for them there to exactly gauge the situation or the cause which prompted the outbreak, but they could agree to a sense of thankfulness that there had been little real fighting with its dire consequences. He feared, however, that much damage had been done to property in some parts of the island. As regarded their own property, he was glad to say that no serious damage had been suffered. Coming to the actual working of the company on the revenue account the receipts were £17,638 from traffic, and £1,459 from interest on investments, a total of £19,097, as against a total of £16,272 in 1905. Their expenses were £6,404, or £70 more than in 1905. This left them a balance of £12,693, to which they could add £5,604 brought forward from the previous half-year, making a total of £18,297. This enabled them to meet their obligations on the preference shares amounting to £3,000, to place £5,000 to reserve, and to recommend a dividend at the rate of 5 per cent. per annum on the ordinary shares. He hardly need remind them of the great benefit it was to have the reserve fund again increasing, because as they were aware, it had been heavily depleted by the cost of the new Cienfuegos-Santiago cable and other outlays since December 31st, 1903, when the reserve stood at the noble sum of £155,000. The items in the balance-sheet were very similar to those of last year, and the only point he need refer to was that they had omitted the item of the claim against the United States with the corresponding suspension account for the damage done to their cables during the Spanish-American War. The claim was, of course, maintained in the company's books, and they were still prosecuting it with the help of the Foreign Office, but he regretted that he had no special information to give them on that occasion. The French Cable Co. were apparently in very much the same position as they themselves were. As regarded the subsidy due to them on the coast cables, their claim had not yet been decided by the Supreme Court of the Island of Cuba, but he hoped they would receive a favourable decision. Their services during the late rising were of considerable value in helping to maintain communications. The land lines were all destroyed, and at the request of the authorities they kept their offices open day and night. Their staff did their very best for the Government, and they trusted that the assistance they were able to give would earn them some small amount of gratitude from the authorities.

Mr. G. Keith seconded the motion.

A Shareholder pointed out that had it not been for the amount placed to reserve fund they could have paid 10 per cent. He asked if the board intended to go on placing to the reserve fund when the fund had reached £100,000.

The Chairman said they must maintain the reserve fund as they made no provision for depreciation of cables except by adding to the reserve fund. It might be that the board would stop adding to the fund when it had reached £100,000, but he would not like to say anything to bind the board when the time arrived. Whatever decision they arrived at must be governed by the state of their cable at that date. Their policy was to keep the business sound, and they must maintain a reserve to meet any eventualities which might occur.

The motion was then carried.

Western Union Telegraph Co.—The *Journal of the Telegraph* publishes the quarterly statement of the company up to September 30th last. The surplus at June 30th last was $16,848,728 (£3,369,745); the revenue received and estimated to come in up to September 30th is $2,000,000 (£400,000), bringing available funds up to $18,848,728 (£3,769,745). After making appropriations for interest on bonds and dividends, a sum of $17,299,018 (£3,459,603) remains to be carried forward.

De Mello Brazilian Rubber Co., Ltd.—This company held its statutory meeting at Salisbury House, E.C., on 9th inst., Mr. Charles Steel presiding.

Metallic Seamless Tube Co., Ltd.—The directors propose to pay a dividend of 5 per cent. on the ordinary shares, carrying forward £2,603.

Selangor Rubber Co.—The directors have resolved to declare an interim dividend for the six months ended June 30th last at the rate of 30 per cent. per annum. They state that there is every indication that the final distribution for the year will be in excess of the interim dividend now declared.

Ceylon (Para) Rubber Co., Ltd.—This company's meeting was held on Tuesday, Mr. W. Forsythe presiding. It was stated that by the end of the year 1,321 acres would be planted with rubber. It was not thought that they would require further capital, but if they did they would have no difficulty in getting it. In the opinion of experts their rubber might be improved by the smoking process.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

Manx Electric Railway Co., Ltd.—22,900 5½ per cent. cumulative preference shares of £5 each, fully paid. Nos. 301 to 21,635 and 23,436 to 25,000; and £200,000 4½ per cent. first mortgage debenture stock.

The Committee have appointed a special settling day as under:—

Thursday, October 25th.—Lisbon Electric Tramways, Ltd.—Further issue of 94,188 ordinary shares of £1 each, fully paid, Nos. 500,001 to 594,188.

And ordered the undermentioned securities to be quoted in the Official List:—

Calcutta Tramways Co., Ltd.—29,330 5 per cent. cumulative preference shares of £5 each, fully paid, Nos. 1 to 29,330.
Lisbon Electric Tramways, Ltd.—Further issue of 94,188 ordinary shares of £1 each, fully paid, Nos. 500,001 to 594,188.

Kalgoorlie Electric Power and Lighting Co., Ltd.—A meeting of this company has been convened for 22nd inst. to consider a scheme for reorganisation. The board recommends that the business and assets of the present company be taken over by a new company, the nominal capital of which shall be 175,000 6 per cent. preference shares of £1 each, £175,000; 100,000 ordinary shares of 10s. each, £50,000 = £225,000.

Electrolytic Alkali Co., Ltd., Middlewich.—The report for year ending August 31st has been issued, and shows a net profit, after allowing for depreciation, debenture interest, renewals, &c., of £12,095. It is proposed to pay 1½ years' dividend out of three years which have accrued on the preference shares. This will absorb £10,496, and will admit of £2,127 being carried forward. The improved position of the company has resulted from an increased output and economy of production, prices being practically the same.

Oriental Telephone and Electric Co., Ltd.—The directors have declared the following interim dividends:—3 per cent. on the 6 per cent. cumulative preference shares for the current year, less income-tax, and 3 per cent. on the ordinary shares, free of income-tax, payable to those shareholders whose names are on the share registers of the company at this date.

Prospectus.—*City and South London Railway Co.*—The company is offering £150,000 of 5 per cent. 1903 preference stock at 105, the money being required in connection with the Euston extension, which is now proceeding.

Globe Telegraph and Trust Co., Ltd.—A quarterly dividend of 2s. on the ordinary shares has just been declared.

MARKET QUOTATIONS.

Wednesday, October 17th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	per cwt.	22/-	..
a ,, Oxalic	per cwt.	32/-	..
a ,, Sulphuric	per cwt.	5/6	..
a Ammoniac, Sal	per cwt.	42/-	..
a Ammonia, Muriate (crystal)	per ton	£33 10	..
a ,, ,,	per ton	£30	..
a Bleaching powder	per ton	£5 10	..
a Bisulphide of Carbon	per ton	£18	..
a Borax	per ton	£15	..
a Benzole (90 %)	per gal.	10¾d.	½d. inc.
a ,, (50 %)	per gal.	1/-	2d. inc.
a Copper Sulphate	per ton	£30 10	£4 10 inc.
a Lead, Nitrate	per ton	£28	..
a ,, White Sugar	per ton	£31	..
a ,, Peroxide	per ton	£27 10	..
a Methylated Spirit	per gal.	2/6	..
a Naphtha, Solvent (90 % at 160° C)	per gal.	5/6	..
a Potassium Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a Potassium Cyanide	per lb.	8½d.	..
a Shellac	per cwt.	220/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	per ton	£6 10	..
a ,, Recovered	per ton	£5 10	..
a ,, Lump	per ton	£5	..
a Soda, Caustic (white 70 %	per ton	£10 15	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	2¾d.	..
a ,, Cyanide	per lb.	7½d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£200	..
b ,, Wire, in ton lots	per ton	£220	..
b ,, Sheet, in ton lots	per ton	£210	..
b Babbitt's metal ingots	per ton	£48 to £140	..
c Brass (rolled metal 2" to 12") basis	per lb.	10½d.	¼d. inc.
c ,, Tube (brazed)	per lb.	1/0	¼d. inc.
c ,, ,, (solid drawn)	per lb.	11½d.	¼d. inc.
c ,, Wire, basis	per lb.	10½d.	¼d. inc.
c Copper Tubes (brazed)	per lb.	1/1¾	1d. inc.
c ,, ,, (solid drawn)	per lb.	1/2	1d. inc.
g Copper Bars (best selected)	per ton	£113	£5 inc.
g Copper Sheet	per ton	£113	£5 inc.
g ,, Rod	per ton	£113	£5 inc.
a ,, (Electrolytic) Bars	per ton	£103	£5 inc.
a ,, ,, Sheets	per ton	£115	£5 inc.
a ,, ,, Rod	per ton	£105	£4 inc.
a ,, ,, H.C. Wire	per lb.	1/0½	⅝d. inc.
f Ebonite Rod	per lb.	8/8	..
,, Sheet	per lb.	8/-	..
m German Silver Wire	per lb.	1/7	1d. dec.
h Gutta-percha, fine	per lb.	6/- to 7/-	..
h India-rubber, Para fine	per lb.	5/1	..
i Iron, Charcoal Sheets	per ton	£18	..
i ,, Pig (Cleveland warrants)	per ton	57/-	2/5½ inc.
i ,, Forgings, according to size	per ton	From £11	..
i ,, Scrap, heavy	per ton	47/6 to 50/-	..
i ,, Wire, galvanised No. 8	per ton	£9 15	..
g Lead, English Ingot	per ton	£19 17 6 to £20	17/6 inc.
g ,, ,, Sheet	per ton	£21 17 6 to £22	17/6 inc.
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£7	..
d Mica (in original cases) small	per lb.	6d. to 1/-	..
d ,, ,, ,, medium	per lb.	2/6 to 4/-	..
d ,, ,, ,, large	per lb.	4/6 to 8/6	..
p Phosphor Bronze, plain castings	per lb.	1/3½ to 1/6	2½d.-3d. inc.
p ,, rolled bars & rods	per lb.	1/4½ to 1/5½	2½d.-3d. inc.
p ,, ,, strip & sheet	per lb.	1/5 to 1/8	1d.-4d. inc.
o Platinum	per oz.	nominal	..
e Silicium Bronze Wire	per lb.	1/- to 1/1	..
f Steel, Magnet, acc'd'g to desc'p'n	per ton	£58	..
,, ,, in bars		£15 to £40	..
g Tin, Block (English)	per ton	£198 to £199	£4 inc.
n ,, Wire, Nos. 1 to 16	per lb.	2/4	..
p White Anti-friction Metals— "White Ant" brand	per ton	£46 to £70	..
k Zinc, Sh't (Vieille Montagne bnd.)	per ton	£32 15	..

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, G.P. and Teleg. Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.

The Consumption of Platinum.—It is stated that the present consumption of platinum in the five most important countries of the world amounts to 23,360 lb. per annum. Of this quantity 7,220 lb. are required by the United States, 6,720 lb. by England, 4,770 lb. by Germany, 4,370 lb. by France, and 290 lb. by Russia. On the assumption that 35 per cent. of the metal used is old platinum worked up a second time, the annual demand for fresh platinum amounts to about 15,000 lb., and only about 11,000 lb. are on offer. The present high price of the metal has nothing to do with the rumours that a tax may be put upon it in Russia. The imposition of a tax, it is said, is not probable; and, moreover, if imposed, it would have to be very high to exert any appreciable influence upon the price of so costly a substance.

STOCKS AND SHARES.

Tuesday Afternoon.

With a 5 per cent. Bank Rate, it may well be imagined that markets find some difficulty in pursuing the cult of cheerfulness. So far as the immediate result of the alteration went, prices withstood the change with decided firmness, but its effect upon business is marked in all the investment sections. There was little enough trade in these departments before, but now still less is doing. For the investor can get 3½ per cent. on his money by leaving the capital on deposit, and this he elects to do in many cases, preferring to wait for a settlement of financial affairs, domestic and foreign, before selecting investments of a more or less permanent character.

Sharp falls in Charing Cross, West End Ordinary and City of London Ordinary have lowered the respective prices to 4 and 10 respectively. For this movement the only assignable reason is a slight pressure to sell a few shares upon an unwilling market. County of London keep fairly steady at 5½, having regained the 4s. dividend deducted from the price last pay-day. Hove shares at 8¼ are ¼ lower, the dividend accounting for 4s. of this. South Metropolitan Ordinary fell a shade to 13s. 9d., but the Preference at 26s. 3d. have hardened.

Ten per cent. is the rate of dividend declared by the London Motor-Omnibus Company on its Ordinary shares, making this amount for the full year. The report was received with more than average interest in order to see how the company had treated the question of depreciation. Judging by the comments of a fairly wide circle of critics, it seems manifest that the provision set aside for this fund is not regarded as anything too lavish. The price of the shares went down to 24s. after the dividend was announced, but has since recovered to about $1\frac{5}{16}$, while the Preference are 3⅞ only.

Home Railway stocks are steady, so far as the electrical lines are concerned. Stocks in the steam railway companies continue heavy, and apprehensive of Parliamentary championship of Labour's alleged rights in the autumn session at Westminster, Metropolitan Consolidated is 60½, and District Ordinary 22. A rise of a point in City and South London Ordinary makes the price 44. It is of interest—perhaps even significance—to notice that the company has powers to issue about £75,000 more of the 1901 Preference stock. The price of that now quoted is 114½, while the 1896 Preference stands at 116½ and the 1891—the First Preference—at 120½.

In the Telegraph list the movements are of somewhat mixed nature. A few *ex* dividend markings include Anglo-American Ordinary and Preferred, Direct United States, Eastern Telegraph Ordinary and Preference, "China" shares, West India and Panama First Preference, and Reuters. Besides regaining their 4s. dividend, Direct United States shares have added to their price, making it 16. The Anglo-American Telegraph group, however, is easier, while "China" shares, *ex* 2s. 6d., are quoted 10s. lower at 14. Western Telegraphs declined ⅛, but Submarine Cables Trust are a point higher, allowing for the interest. Great Northerns at 35 have lost two sovereigns, while Globes are unchanged. The regular quarterly dividend of 2s. on the ordinary shares has been declared. Cuban Ordinary rose to 8⅞.

Quiet, too, are National Telephone issues. Report says—and it seems only fair, to everybody, to mention that the *Daily Mail* is responsible for the statement—that the company will replace its present unlimited service, where in force, by another based upon the number of calls made by subscribers. Though this may come to pass some day, it will not do so yet awhile, and then probably only by special agreement with the Post Office. Chili Telephones remain at 7. Monte Video shares again hardened a trifle to 22s. 6d.

After the slump in British Electric Tractions it is only natural for a little support to rally the price of the Ordinary to 4½. Beyond this, Traction shares are exceedingly quiet. The Kalgoorlie Power and Lighting has a scheme on foot for reorganising the company's capital in such a way as to wipe out the arrears of the Preferred shares' dividend, by the allotment of a certain proportion of Ordinary shares in compensation. The mention of a power company serves as a reminder that the bonds of the Rio de Janeiro undertaking have recently lost ground. This has been caused by sales from Toronto (the company is largely a Canadian undertaking), where money rates have lately ruled very high in consequence of the United States gamble in American Railroad shares.

Edison & Swan shares of both kinds are *ex* dividend, as the quotations show. Telegraph Construction have eased off 10s. again. Dick, Kerr shares are *ex* 2s. Vickers at 50s. are a turn better, upon the possibility of an early settlement to the strike on the Clyde. British Aluminium Preference are better at 6¾. The Brazil Street Tramways, which is still unelectrified, declares a 5 per cent. dividend on the Ordinary shares. We hear of a new electric railway which is being constructed in Paris.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. ‡	Dividends for the last four years. 1902.	1903.	1904.	1905.	Closing Quotations Oct. 9th.	Closing Quotations Oct. 16th.	Business done week ended Oct. 16th, 1906. Highest	Lowest.	Rise + or Fall —
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	3¾ — 4¼	3¾ — 4¼	78/9	76/3	..
155,600‡	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	Nil	Nil	5 %	88 — 93	84 — 93	..	..	..
702,800	Anglo-American Telegraph	Stock	60/6	61s.	2½%	3½%	66 — 68	65 — 67 xd	..	..	..
3,148,700	Do. do. do. 6 % Pref.	Stock	6 %	6 %	5½ %	6 %	112½—113½	110½—111½xd	112⅜	110½	..
3,148,700	Do. do. do. Deferred	Stock	1/-	2s.	Nil	1½%	24⅜ — 24⅝	24⅛ — 24⅜	24⅜	24	— ⅛
50,000	Anglo-Portuguese Tel., 5% Mort. Deb. Stock Red.	100	..	..	..	..	101 —103	101 —103	..	..	..
44,000	Chili Telephone, Nos. 1 to 44,000	5	6 %	7 %	8 %	8 %	6¾ — 7¼	6¾ — 7¼	..	..	..
1,932,856‡	Commercial Cable Stlng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	$6½ — $8½ xd	97 — 99	98	97½	+ ½
16,000	Cuba Telegraph	10	6¼%	10 %	5 %	5 %	8½ — 9	8⅝ — 9⅛	8⅞	..	+ ⅛
6,000	Do. 10 % Pref.	10	10 %	5 %	10 %	10 %	17 — 18	17 — 18	..	..	..
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3⅜ — 3⅝	3⅜ — 3⅝	..	..	..
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8¾ — 9¼	8¾ — 9¼	..	..	..
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	98 —101	98 —102	..	..	..
60,710‡	Direct United States Cable	20	3¼%	3 %	3½%	4½%	15⅝ — 15⅞	15⅞ — 16⅛ xd	16 1/16	15 7/16	..
65,500	irect W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	100½—102½	..	..	+ ½
4,000,000	Eastern & elegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	144 —147	143 —146 xd	143½	143½	..
2,000,000	D o. 8½ % Pref. Stock	100	8½%	8½%	8½%	8½%	90½ — 92½	89½ — 91½ xd	91	90½	..
1,848,772	D o. 4 % Mort. Deb. Stock Red. ..	Stock	4 %	4 %	4 %	4 %	107 —109	107 —109	108½	..	..
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	14½ — 14¾	13⅞ — 14¼ xd	14 1/16	13⅞	..
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	105½—107½	105½—107½	106¾	105½	..
800,000	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	99 —101	99 —101	..	..	..
200,000‡	Do. 4 % Reg. M. Debs. (Mauritius S ⊇ b.) 1 to 8,000	25	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..
180,887	Globe Telegraph and Trust	10	£3	5½%	5½%	5½%	10¾ — 11½	10¾ — 11½	11 5/8	11	..
180,887	Do. do. 8 % Pref.	10	6 %	6 %	6 %	6 %	14⅜ — 14¾	14⅜ — 14⅝	14 1/16	14 1/16	..
150,000	Great Northern Telegraph, of Copenhagen ..	10	12½%	15 %	24 %	24%	36 — 38	34 — 36	37¼	36½	— 2
37,900	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,900, Red.	100	4½%	4½%	4½%	4½%	100 —102	100½—102½	..	..	+ ½
17,000	Indo-European Telegraph	25	10 %	10 %	13 %	13 %	59 — 61	59 — 61	59½	..	..
251,127	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	⅞ — 1⅛	1 — 1⅛	22/-	21/6	+ ⅛
72,680	Monte Video Telephone Co., Ltd. Ord.	1	3 %	3 %	4 %	5 %	1 — 1⅛	1 1/16 — 1 1/8	..	..	+ 1/16
86,492	Do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	⅞ — 1	⅞ — 1	..	..	..
1,983,333	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 —111	110½	109½	..
1,966,667	Do. do. Def. Stock	100	4½%	5 %	5 %	5 %	109 — 111	109 —111	110⅜	109⅜	..
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	6 %	11 — 13	11 — 13	..	..	..
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½ — 12½	10½ — 12½	..	..	..
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5¼ — 5⅝	5⅛ — 5⅝	5⅝	5 1/16	..
2,000,000	Do. do. 8½ % Deb. Stock Red. ..	Stock	8½%	8½%	8½%	8½%	98 — 100	98 —100	99⅛	98⅛	..
1,689,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	102 —104	102 —104	103½	103¼	..
179,313	Oriental Telep. and Elec. 1 to 171,604, fully paid	1	6 %	6½%	6½%	7½%	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1 5/16 — 1 1/8	1 5/16 — 1 1/8	..	..	..
100,000	Do. do. do. 4% Red. Deb. Stock	100	..	..	..	4 %	97 — 99	97 — 99	98	..	..
100,000	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..
11,888‡	Reuter's	8	5 %	5 %	5 %	5 %	7½ — 8	7¼ — 7¾ xd	7¼	..	..
60,000	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	..	..	4½%	101 —104	101 —104	..	..	..
8,201	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	129 —132	129 —132	..	..	..
70,000	United River Plate Telephone	5	7 %	8 %	8 %	8 %	7 — 7½	7 — 7½	..	..	..
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5¼ — 5½	5¼ — 5½	..	..	..
179,947	Do. do. 5 % Debs.	Stock	5 %	5 %	5 %	5 %	109 —112	109 —112	..	..	..
15,609‡	West African Telegraph, Shares	10	2 %	4 %	4½%	4 %	9⅜ — 10⅛	9⅜ — 10⅛	..	..	..
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	Nil	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..
160,000	Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4 %	4 %	4 %	4 %	100½ — 103½	100½—103½	14⅛	14⅛	— ⅛
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	5 %	14⅛ — 14⅜	14⅛ — 14⅜	14½	14⅛	— ⅛
75,000	Do. do. 5 % Debs. 2nd series, 1906	100	5 %	5 %	5 %	5 %	.. ..	.. ..	..	..	..
563,380	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	103 —106	103 —106	104	103	..
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	⅜ — ½	⅜ — ½	..	..	..
84,563	Do. do. 6 % Cum. 1st Pref.	10	7 %*	7 %*	6 %	5 %	6⅝ — 6¾	6⅝ — 7⅛	6⅞	..	+ ⅜
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	Nil	4½ — 5½	4½ — 5½	..	..	..
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	90 —102	99 —102	..	..	..

Including arrears.

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 280,008 to 430,007 .. Do. Nos. 430,008 to 910,007 and 560,008 to 580,007	5	..	..	8 %	8 %	7 1/16 — 7 5/16 xd	7 1/16 — 7 5/16	7¼	7⅛	..
260,007	Do. 5½ % Cum. Prefs., 1 to 260,007 ..	5	..	5 %	5 %	5½%	5 13/16 — 6 1/16	5 13/16 — 6 1/16	5 13/16	5 13/16	..
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	..	6 %	6 %	6 %	139 —142	139 —142	..	..	..
285,100	Auckland E. Trams., 5 % 1st Mort. Deb. Stock ..	100	..	5 %	5 %	5 %	103 —105	103 —105	104½	..	..
800,000	Babcock & Wilcox, 1 to 580,000	1	..	17 %	20 %	20 %	3⅞ — 4⅛ xd	3⅞ — 4⅛	81/3	79/4½	..
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	..	6 %	6 %	6 %	1 7/16 — 1 9/16 xd	1 7/16 — 1 9/16	..	..	..
88,000	British Aluminium, Ord., 2,001 to 40,000	5	..	..	7 %	7 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..
40,000	Do. do. 7 % Cum. Pref...	5	Nil	Nil	7 %	7 %	6¼ — 6⅝	6¼ — 7	6⅞	6⅝	+ ⅛
20,000	Do. do. "A" 6 % Cum. Pref.	5	Nil	Nil	6 %	6 %	5¼ — 5⅝	5¼ — 5⅝	..	..	..
20,000	Do. do. 4 % Funding Certs.	5	..	..	4 %	4 %	4 — 4¼	4 — 4¼	..	..	..
800,000‡	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	104 —108	104 —108	105¼	..	..
800,000	British Columbia E. Rail Def. Ord. Stock	100	..	6 %	6 %	6 %	125 —130	122 —125	..	..	..
800,000	Do. 5 % Pref. Ord. Stock	100	..	5 %	5 %	5 %	110 —115	110 —115	115	..	..
115,000	Do. 5 % Cum. Perp. Pref. Stock	100	..	5 %	5 %	5 %	108 —111	108 —111	..	..	..
240,400	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	..	4½%	4½%	4½%	104 —106	102 —104 xd	..	..	..
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	..	4½%	4½%	4½%	102 —105	103 —106	..	..	+ 1
133,301	British Electric Traction	10	8 %	6 %	6 %	3 %	3⅜ — 4⅜	4 — 5	92/6	82/6	+ ½
161,487	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	6 %	8 — 9	8 — 9	8 7/16	8 3/16	..
1,415,422‡	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	107 —111 xd	107 —111	109½	109	..
410,178	Do. do. 4½ % 2nd Deb. Stock Red.	100	..	..	4½%	4½%	99 — 93	92½ — 95½	91½	..	+ 1/2
100,000	British Insulated and Helsby Cables	5	10 %	8 %	8 %	8 %	6¼ — 6⅝	6¼ — 6⅝	..	..	..
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5⅝ — 6⅛	5⅝ — 6⅛	5⅞	..	..
500,000	Do. do. 4½ % 1st Mort. Deb. Red.	100	4½%	4½%	4½%	4½%	102 —105	102 —105	103½	..	..
212,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	..	4½%	4½%	4½%	94 — 98	94 — 98	..	..	..
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	..	6 %	Nil	..	1 — 1⅛	1 — 1⅛	26/10½	..	..
1,016,353	Do. do. 4 % Mort. Deb. Stock ..	100	..	4 %	4 %	4 %	77 — 80	77 — 80	78⅜	77½	..
50,000	¶Browett, Lindley & Co., Ord.	£1	Nil	Nil	Nil	..	⅝ — ¾	⅝ — ¾	..	..	..
50,000	¶ Do. do. 6 % Cum. Pref. ..	£1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..
105,781	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	Nil	Nil	Nil	2½%	¾ — 1	¾ — 1	..	..	..
150,000	Do. Non-cum. 6 % Pref... ..	2	6 %	6 %	6 %	6 %	1⅛ — 1⅜	1⅛ — 1⅜	29/4½	..	..
125,000‡	Do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	96 — 98	96 — 98	..	..	..
125,000‡	Do. 4½ % Perp. 2nd Deb. Stock	Stock	4½%	4½%	4½%	4½%	82 — 84	82 — 84	..	..	..
100,000	Buenos Ayres & Belgrano, 1 to 100,000	5	..	3 %	4 %	3 %	3 — 3¼	3 — 3¼	63/9	..	..
40,000	Do. "A" 6 % Cum. Pref., 1 to 40,000	5	..	6 %	6 %	6 %	5⅛ — 5⅜ xd	5⅛ — 5⅜	..	..	..
27,500	Do "B" do. 1 to 27,500	5	..	6 %	6 %	6 %	4⅛ — 6⅜ xd	4⅛ — 5⅜	..	..	..
317,700	Do. 5 % Deb. Stock	100	..	5 %	5 %	5 %	105 —107	105 —107	..	..	..
190,000	Do. 5 % 2nd Deb. Stock	100	..	5 %	5 %	5 %	102 —105	102 —105	..	..	..
105,000	Calcutta Trams., 1 to 105,000	5	..	6 %	8 %	8 %	8 — 8¼ xd	8 — 8¼	8 1/16	..	..
32,610	Do. 105,001 to 137,610	5	..	..	..	8 %	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..
350,000	Do. 4½ % 1st Deb. Stock	100	..	..	4½%	4½%	103 —106	103 —106	..	..	..
85,000	Callender's Cable Construction shares	5	15 %	12½%	12½%	15%	10¾ — 11¼	10¾ — 11¼	10 5/16	10¼	..
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5⅜ — 5¾	5⅜ — 5¾	..	..	..
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	108 —110	108 —110	109½	108⅜	..
491,222	Cape E. Trams., 1 to 491,222	1	..	15 %	10 %	5 %§	⅜ — ⅝	⅜ — ⅝	..	..	..
450,000	Castner-Kellner Alkali, 1 to 450,000	1	..	4 %	4 %	6 %	1 3/16 — 1 5/16	1 3/16 — 1 5/16	..	..	..
230,211	Do. do. 4½ % 1st Mort. Deb. Stock	100	..	4½%	4½%	4½%	97 —102	97 —102	100	..	..
1,989,698	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	4 %	83 — 85	83 — 85	84½	..	..
530,316	Do. do. 4 % Pref. Stock ..	Stock	4 %	4 %	4 %	4 %	97 — 99	97 — 99	99¼	99	..
530,316	Do. do. Def. do.	Stock	4 %	4 %	4 %	4 %	73 — 76	73 — 76	75	73⅜	..
1,480,000	City and South London Railway	Stock	3½%	2⅜%	2½%	17%	42 — 44	43 — 45	44½	43½	+ 1
85,000	Crompton & Co., Nos. 1 to 85,000	5	5 %	2½%	2½%	2½%	1½ — 1⅝	1½ — 1⅝	32/6	30/7½	..
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 98	95 — 98	95⅜	..	..

* A period of nine months. † Quotations on Liverpool Stock Exchange. ‡ Unless otherwise stated all shares are fully paid. § Interim dividends.
‖ And bonus of 10s. ¶ From Manchester Share List.

(Continued on next page.)

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued)*

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—*(continued).*

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1902.	1903.	1904.	1905.	Closing Quotations Oct. 9th.	Closing Quotations Oct. 16th.	Business done week ended Oct. 16th, 1906. Highest	Lowest.	Rise + or Fall—
260,000	Dick, Kerr & Co., 1 to 260,000	1	..	..	10 %	..	18— 17	1¼— 1⅜ xd	34/-	..	..
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	..	6 %	6 %	6 %	1 1/16— 1 1/16 xd	1 1/16— 1 1/16	23/9	..	..
294,150	Do. do. 4½ % Deb. Stock	100	..	4½ %	4½ %	4½ %	103 —106	103 —106	..	..	..
60,000	Dublin United Trams. (1896), 1 to 60,000	10	..	5¾ %	6 %	6 %	14 — 15	14 — 15	..	..	..
59,987	Do. 6% Pref. between 1 and 60,000	10	..	6 %	6 %	6 %	14 — 15	14 — 15	..	..	..
99,261	Edison & Swan Utd., "A" shrs., £8 pd., 1 to 99,261	5	Nil	Nil	2½ %	4⅛ %	1⅝— 1⅞	1¾— 1⅞ xd	..	..	..
17,189	Do. "A" shares, 01—017,189	5	Nil	Nil	2½ %	4⅛ %	2⅛— 3	2¼— 2¾ xd	..	..	..
844,023‡	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	86 — 88	86 — 88	..	..	..
100,000‡	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	90 — 95 xd	90 — 95	..	..	..
112,100	Electric Construction 1 to 112,100	2	6 %	4 %	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	7 %	7 %	7 %	7 %	1 1/16— 2 1/16	1 1/16— 2 1/16	..	..	..
200,000	Do. do. 4 % Perp. 1st Mort. Deb. Stk.	Stock	4 %	4 %	4 %	4 %	84 — 87	83 — 86	..	..	—1
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	9 — 9⅛	9 — 9⅛	..	..	..
200,000	Do. do. 4 % Mort. Deb.	Stock	4 %	4 %	4 %	4 %	91 — 94	91 — 94	..	..	..
78,000	Gt. N. & City Rail Pref. Ord. "A" 4 % 1 to 78,000	10	..	3 %	4 %	4 %	3¾— 4	3¾— 3⅞	..	..	— ¼
96,000	Greenwood & Batley 7 % Cum. Pref.	10	..	7 %	7 %	7 %	10½— 10⅝	10½— 10¾	..	..	..
80,000	Do. do. 5 % Mort. Debs.	100	..	5 %	5 %	5 %	101 —102	101 —102	..	..	..
200,000	Henley's (W. T.), Telegraph Works, Ord.	5	20 %	15 %	15 %	15%	12 — 13	12 — 13	..	..	..
900,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	4½ %	5⅝— 5¾	5⅝— 5¾	5 5/16	5 9/32	..
150,000	Do. do. 4½ Mort. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	107¾—109¾	107¾—109¾	..	..	..
50,000	India-Rubber, Gutta-Percha & Telegraph Works..	10	10 %	10%	5 %	10%	17 — 18	17 — 18	17¾	17⅞	..
37,500	†Liverpool Overhead Railway, Ord.	10	1½%	13%	14%	Nil	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	..
10,000	† Do. do. Pref. £10 paid	10	5 %	5 %	5 %	5 %	4½— 6½	4½— 6½	..	..	..
600,070	London United Trams (1901), 1 to 50,007	10	..	8 %	6 %	3 %	8 — 8½	8 — 8½	..	..	..
899,930	Do. do. 50,008 to 100,000 (£6 paid)	10	..	8 %	6 %	3 %	3½— 4½	3¾— 4¾	..	..	..
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	..	5 %	5 %	5 %	9 — 9⅜	9 — 9⅜	..	..	..
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	..	4 %	4 %	4 %	93 — 96	93 — 96	..	..	..
314,016	Metropolitan Electric Trams, Defd.	1	Nil	Nil	Nil	3 %	⅛— 3/16	⅛— 3/16	..	..	..
500,000	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/16— 5/16	3/16— 5/16	17/6	..	..
950,000	Do. 4½ % Deb. Stock Red.	100	..	..	4½ %	4½ %	98 —100	95 —100	..	..	—1½
150,000	Peebles (B.) & Co. 6 % Cum. Pref., 20,001 to 50,000	5	..	..	6 %	6 %	4½— 5 xd	4½— 5	..	..	..
24,500	Potteries E. Trc., 20,001 to 40,000 & 50,001 to 54,500	10	..	5 %	5 %	4 %	6½— 7½	6½— 7½	..	..	..
24,500	Do. 5 % Cum. Pref., 1 to 20,000 & 40,001 to 44,500	10	..	5 %	5 %	5 %	7½— 8½	7½— 8½	..	..	..
245,000	Do. 4½ % Deb. Stock	100	..	4½ %	4½ %	4½ %	100 —103	100 —103	..	..	..
37,350	Telegraph Construction and Maintenance	12	20 %	20 %	15 %	15 %	33 — 35	32½— 34½	32½	33	— ½
150,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red. 1909	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..
8,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	..	..	5 %	5 %	90 — 92	90 — 92	..	..	..
540,000	Waterloo & City Railway, Ord. Stock	100	3½%	3½%	3½%	3½%	101 —104	101 —104	101	..	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	5	3½%	3 %	Nil	Nil	⅛— 1	⅛— 1	..	..	..
66,666	Do. 6 % C. P., 80,001 to 80,000 & 125,001 to 141,666	5	..	6 %	Nil	Nil	1½— 2½	1½— 2½	..	..	..
246,806	Do. 4 % 1st Mort. Deb. Stock	100	..	4 %	4 %	4 %	75 — 80	75 — 80	..	..	..

ELECTRICITY SUPPLY COMPANIES.

14,000	Bromley (Kent) E.L. & P., 1 to 14,000	5	..	5 %	5⅛%	4 ⅝%	5 — 5⅛ xd	5 — 5⅛	..	..	..
50,000	Do. do. 4½ % 1st. deb. stock	100	..	4½%	4½%	4½%	101 —104	101 —104	..	..	..
29,377	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	8 %	10 %	10 %	10 %	8½— 8⅝	8½— 8⅝	..	..	..
10,623	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7⅞— 8	7⅞— 8	..	..	..
800,000	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	101 —104	101 —104	..	..	..
80,000	Charing Cross and Strand Electricity Supply	5	10 %	8 %	8 %	5 %	4¼— 4⅜	3¾— 4⅛	80/7½	75/-	— ½
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛— 5	4⅛— 5	..	..	..
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	4 — 4½	4 — 4½	..	..	..
420,000	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	101 —104	101 —104	102⅞	..	..
44,436	Chelsea Electricity Supply, Ord.	5	4½%	5%	6 %	6 %	5¼— 5⅝	5¼— 5⅝	5¼	..	..
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	5 %	5 %	6 %	6 %	9⅜— 10⅛	9¼— 10¼	10⅛	9 9/16	— ¼
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½— 12½	11¼— 12½	..	..	..
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	123 —126	123 —126	..	..	..
800,000	Do. 4½ % 2nd Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..
40,000	County of Durham Electrical Power, Ord.	2	4 %	4 %	£3 7 0	4 %	2⅛— 3 1/16	2⅛— 3 1/16	..	..	..
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4 %	4 %	4½%	5 %	8⅛— 8⅜	8⅛— 8⅜	..	..	..
80,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	11½— 12	11¼— 12	..	..	..
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	107 —110	107 —110	..	..	..
400,000	Do. do. 4½ % 2nd Deb. Stock	Stock	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	7 %	7 %	4 %	3⅛— 3⅜	3⅛— 3⅜	70/-	68/9	..
80,000	Do. do. 6 % Cum. Pref.	..	6 %	6 %	6 %	6 %	4⅛— 5⅜	4⅛— 5⅜	..	..	..
820,000	Do. do. 4½ % 1st Mort Deb. Stk	100	4½%	4½%	4½%	4½%	100 —103	100 —103	101¼	5 16	..
10,000	Folkestone, 1 to 10,000	5	..	5½%	5½%	5½%	5¼— 5⅝ xd	5¼— 5⅝	..	..	..
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	..	..	5 %	4½— 5⅝ xd	4¼— 5⅝	..	..	..
75,000	Do. 4½ % 1st. Deb. Stock	100	..	4½%	4½%	4½%	99 —102	99 —102	..	..	..
13,000	Hove, 1 to 13,000	5	..	8½%	8½%	9 %	8¼— 8⅜	8 — 8⅛ xd	..	..	..
10,000	Do. New (£6 10s. paid)	£3	..	8½%	8½%	9 %	6½— 7½	6⅞— 7½	..	..	..
37,300	Do. 4 % Deb. Stock	100	..	4 %	4 %	4 %	98 —100	98 —101	..	..	+ ½
7,300	Do. 4½ % Deb. Stock	100	..	4½%	4½%	4½%	98 —100	98 —101	..	..	+ ½
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	12½	12 %	10 %	9½— 10⅜	9⅜— 10⅜	..	..	..
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..
111,000	London Electric Supply Corporation, Limited, Ord.	8	Nil	Nil	3 %	4 %	1⅞— 2⅛	1⅞— 2⅛	..	..	..
60,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	6 %	5 — 5⅜	5 — 5⅜	..	..	..
874,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..
200,000	Metropolitan Electric Supply, 1 to 100,000	5	7½%	8½%	10 %	10 %	7⅛— 8⅛	7⅛— 8⅛	7⅞	7⅞	..
76,121	Do. 4½ % Cum. Pref. 1—71,106, £3 pd.	5	4½%	4½%	4½%	4½%	5⅛— 5⅝	5⅛— 5⅝	..	..	..
220,000‡	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	109 —113	109 —113	..	..	..
250,000‡	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	95 — 97	95 — 97	..	..	..
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..
75,000	Newcastle-on-Tyne, 1 to 75,000	5	..	8 %	8 %	8 %	7⅝— 8	7⅝— 8	..	..	..
75,000	Do. 5 % Pref., 1 to 75,000	5	..	5%	5 %	5 %	5⅝— 6⅛	5⅝— 6⅛	..	..	..
10,852	Notting Hill Electric Lighting	10	6 %	6 %	7 %	7½%	13⅜— 14½	13⅜— 14½	..	..	..
64,000	Do. do. 4 % 1st Mort.Deb.	100	4 %	4 %	4 %	4 %	96 — 98 xd	96 — 98	..	..	..
18,500	Oxford, 1 to 96 and 407 to 18,810	5	..	6½%	7 %	7 %	6 — 6½	6 — 6½	..	..	..
50,000	Do. 4 % Deb. Stock	100	..	4 %	4 %	4 %	98 —100	98 —100	..	..	..
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	14½%	14½%	12½%	9¼— 10⅛	9¼— 10⅛	9⅛	..	..
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	7 — 8	7 — 8	..	..	..
150,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3½%	3½%	3½%	95 — 97	95 — 97	95	..	..
12,000	Smithfield Markets Electric Supply, Ord.	5	2½%	4 %	4 %	4 %	1 — 2	1 — 2	..	..	..
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	74 — 78	74 — 78	..	..	..
65,000	South London Electricity Supply, Ord.	5	12%	8 %	4 %	4 %	2⅜— 3⅛	2⅜— 3⅛	..	..	..
103,700	South Met. Elec. Lt. & Power (Ord.	1	Nil	Nil	Nil	2½%	⅛— ¼	⅛— ¼	14/9	..	— 3/32
85,368	*(Late Blackheath and Greenwich* 7 % Pref.	1	Nil	7 %	7 %	7 %	1⅛— 1⅜	1 1/16— 1 1/16	..	..	+ 1/16
148,292	*Dist. E.L.Co.)* 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	102 –105 xd	102 –105	..	..	..
50,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	3⅜— 3⅝ xd	3⅛— 3⅜	66/3	..	..
80,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	4¼— 4⅝ xd	4¼— 4⅝	90/-	..	..
00,000	Do. do. 4½ % 1st Mort. Db. Stk. Red	100	..	..	4½%	4½%	97 —100 xd	97 —100	..	..	..
110,000	Westminster Electric Supply, Ord.	5	12 %	13½%	14 %	18 %	9 — 10	9 — 10	9 9/32	9⅛	..
26,151	Do do. 4½ % Cum. Pref.	5	5 %	5 %	5 %	5 %	5¼— 5⅝	5¼— 5⅝	5 5/16	5 9/32	..
	(Originally 5 %—Red. to 4½ % from 31st Dec., 1905.										

Shares not officially quoted:—Mackay Companies, ord., 74—76. Pref. 72—74.

† Unless otherwise stated all shares are fully paid. ‡ Interim dividends.

(Bank rate of discount 5 per cent. October 11th, 1906).

ELECTRIC LIGHTING BY WIND POWER.

By E. LANCASTER BURNE, A.M.I.C.E., A.M.I.M.E.

Although possessing attractions, the utilisation of the wind as a motive power for electrical installations has hitherto received but scant attention, consequently information derived from experience is meagre; but judging by what has been done in this direction, the scheme is not only feasible, but has, under certain conditions, very considerable claims to a more extended adoption.

Broadly speaking, wind is obtainable everywhere in unlimited quantity, absolutely free of cost, but its irregularity and uncertainty render its employment as a motive agency only economically possible in cases where the work may be suspended at varying intervals, or consists of the storage of energy for future use.

Power production by internal combustion engines is now so cheap, that except in inaccessible districts, it is rarely advisable to depend upon the wind for driving machinery that requires exclusive attention. The storage of energy has, however, greater possibilities; of the two practical systems at present known, viz., the raising of water to reservoirs for ultimate distribution and the charging of secondary batteries, much has been done with the former, and the information thus gained should go some way towards solving the problems of the latter.

The natural order in which to study the subject will be, firstly, to consider the wind itself; secondly, the motor; and, finally, the installation as a whole.

As prevailing wind velocities depend very largely upon locality, accurate information on this point can only be gained by anemometrical observations, spread over a considerable period; but for our present purpose a generalisation will suffice.

At fairly exposed inland places in England the total wind miles of the year, reduced to a mean speed, amount to about 7½ miles an hour; for approximately half the year the velocity is not less than 10 miles an hour, and, under favourable conditions, a speed of 15 miles and over may be expected for about one-third. During the winter months the above averages, which are for the whole year, will be from 10 to 15 per cent. higher—a fortunate circumstance in the present connection. In very open places, such as the sea coast, these rates will be exceeded.

The drawback is that the breezy periods do not succeed each other at regular intervals, and calms, lasting from three days to a week, must be provided against—the latter period is sometimes, although rarely, exceeded. Incidentally it may be mentioned that the velocity of the wind at 100 ft. from ground level is about 20 per cent. greater than at 50 ft., and about 10 per cent. less than the latter at 25 ft., so that apart from the necessity of being clear of all obstructions to the free flow of the wind, a good elevation is desirable for a windmill.

Although pumping mills of the disk type will, when not overloaded, commence working in a breeze of about five miles per hour, the amount of work performed is so slight, and the speed so low, that for practical power purposes any wind below 10 miles an hour may be disregarded.

The pressure of a 10-mile wind is four times that of a 5-mile wind; it is, therefore, eight times as powerful, or, in other words, the power varies as the cube of the velocity. Theoretically the power of a windmill follows the same law; in actual work, however, this would be subject to modification.

Assuming the internal frictional losses to be practically constant, in light breezes the power absorbed in driving the mill itself will bear such a large proportion to the kinetic energy of the wind that very little would be available for performing work. On the other hand, with winds of high velocity the rotative speed of the mill would become too great if permitted to increase in the same ratio, therefore, to avoid racing, sail has to be shortened, or other provision made, to allow a proportion of the wind force to be run to waste.

The limits of useful wind velocity for power purposes may in consequence be taken as being from 10 up to about 20, or at most 25 miles per hour.

Obviously, the ideal load for a windmill would be one which augmented with increase of speed in the same proportion that the wind pressure bears to its velocity; subject to the considerations named above, a suitable dynamo should, for all practical purposes, fulfil these conditions.

Turning to the wind-motor itself, we have the choice of the old-fashioned windmill with four, five or six "sweeps," or the modern annular disk sail wheel; the horizontal mill does not merit consideration. The disk mill has advantages which have enabled it to supersede its older competitor for motors of moderate size—these will be referred to later—but as constructional considerations impose a limit to the sail area exposed, the four-armed mill, owing to its far higher efficiency per unit of surface, will probably still hold its own when a motor of large size is required. At present disk mills do not appear to be made of a greater diameter than 40 ft.

There cannot be two opinions as to which is the more sightly, and as wind-driven installations would generally be erected on estates, the aesthetic point of view, with due regard for efficiency, should not be overlooked. Practical knowledge concerning the older form of windmill is, with few exceptions, confined to the old country millwrights, a disappearing race; the information derived from mathematical investigation alone, as generally quoted in text-books, is altogether incomplete and misleading. Elsewhere the writer has ventured the opinion that an experimental inquiry of a similar nature to that undertaken by Smeaton—150 years ago—is the only reliable method by which the disposition of the sail area, to give a maximum effect within a given diameter, can be determined. A great deal has been done by the Danish Government in this direction, who some years ago caused trials to be conducted under the supervision of M. Poul la Cour. These experiments, which were made with models driven by an artificial wind, confirm, in the main, existing windmill practice. The conclusions arrived at were as follows:—

1. To obtain the best results the mill should have four rectangular, or approximately rectangular, sails, the breadth of which should be from one-fourth to one-fifth of the radius of the "whip" or radial arm, and the length from three-fourths to four-fifths of the same.

2. The sails should be divided by the whip in the proportion of one to three or one to five, the narrow portion leading.

3. The leading portion should not, at the outer extremity, lie in the same plane as the rest of the sail, but should project at an obtuse angle to it. The versed line of the angle formed by the inclined portion with the other part of the sail should, at the tip, be from 3 to 4 per cent. of the total width of the sail, but the inclination should gradually diminish until, at the inner end of the sail, the surface becomes flat.

4. The straight line subtending the angle at the outer end or tip of the sail should have an angle of 10° with the plane of rotation, this angle should, however, gradually increase as the inner end or "heel" of the sail is approached at which point it should be about 22½°.

5. The speed of the tips should be 2·4 times that of the wind.

6. The work yielded by a mill, constructed in accordance with these conditions, should be 0·04 ft.-lb. per sq. ft. per second, with a wind velocity of 3·28 ft. per second, increasing with the cube of the wind velocity. In practice this increase would, of course, after a certain point, be modified by a rotative speed limit as previously pointed out.

Although much more might be said on this interesting subject, considerations of space compel us to pass on to some of the practical details.

For many centuries the sails of windmills have been formed of canvas spread over wooden framework; such sails give a rather more powerful drive, and are cheaper than the familiar "shuttered" sail, but they have nothing else to recommend them. Their great disadvantage is the total lack of automatic regulation, and this alone quite unfits them for dynamo driving. In the shuttered sweep, it is, perhaps, hardly necessary to point out, the sail surface is

composed of a number of shutters or "valves" constructed of thin boards or light canvas-covered frames. These are hung in sockets so that when occasion requires they can "open" by turning in the same, and, more or less, present their edges to the wind, according to its pressure, and thus allow a portion of it to blow through the sail. The degree of wind pressure required to open the shutters is determined by the resistance of a spring or weight, according to the system employed. Two are in use—the "the spring sweep" and the so-called "patent." In the former, which is the older, the shutters are fitted with levers which are connected to a light "striking" rod, and so arranged that by moving it to or from the centre of the sails, the shutters can be opened or closed similar to the slats in a venetian blind. The striking rod is connected to a spring attached to the whip, the tension of which can be adjusted. Spring sweeps act independently of each other, consequently the load on each is to a great extent equalised; this has its advantages, but, on the other hand, the adjustment of the springs cannot be varied without stopping the mill. In the "patent" sweep this objection is removed by connecting all four striking rods by bell cranks and links to a rod passing through the "windshaft" or axle, the pressure being regulated by the application of weights. This affords a ready means of adapting the resistance of the shutters to the force of the wind or the load on the mill, and has the additional advantage that they can be "struck" before applying the brake. For dynamo driving there is little doubt that a combination of the two systems would be advisable, and there appears to be no reason why the application of a centrifugal governor to assist the action of the weight should not be a great improvement.

The sweeps of windmill sails often attain great dimensions, a span of 75 ft. being not uncommon and very often exceeded. Very wide sweeps have gone out of fashion; in ordinarily-sized flour mills a width of 6 ft. to 6½ ft., increasing by about 1 ft. at the inner end, being quite usual, irrespective of span. Wider sweeps than this are in use, but it is very doubtful if the gain in power is commensurate with the increased area—to say nothing of practical objections; on the other hand, they give a somewhat steadier although slower drive. The same remark applies to mills with more than four sails, the only gain appears to be in steadiness, and this is so slight as not to warrant the extra expense and complication.

Within limits it may be said that the more the area is crowded with sail, the slower will be the speed of the mill, as there is less space between the sweeps for the wind to escape; thus a four-armed mill with a sail surface of, say, 25 per cent. of the total circular area swept by the sails, will have a peripheral velocity of about 2½ times that of the wind, whereas a disk mill with 66 per cent. of sail surface will generally have a circumferential speed about equal to the wind velocity. As the products of the respective areas and speeds nearly agree, the performances of the two mills, according to this reasoning, will not widely differ—other things being equal.

The weather angles or twist of the sails are governed by the relative speed of the same to the wind—the slower the speed the larger the angle—hence the greater twist given to the vanes of a disk mill, this being commonly about 35°. As the weather angles are determined for the moving sail, they are not the most advantageous for starting it from a state of rest, neither will the maximum efficiency be obtained unless a definite velocity ratio be preserved between the sail and the wind. The best "starting" angle is between 55° and 70°, which is more nearly approached by the weathering of a disk mill vane than by that of a four-armed mill sweep. Owing to this, and also to its relatively far greater sail area, the starting "torque" of a disk mill is much higher than that of a four-armed mill, and it will continue working in lighter winds; herein lies it superiority. Its much lower speed is, in small mills, an advantage rather than otherwise, especially when they are mounted upon light skeleton towers; but with large motors this would not apply owing to the extra gearing required to give the requisite speed to the dynamo.

No experiments, of the kind previously referred to, appear to have been made with this type of mill, exclusively; but in 1903 the Royal Agricultural Society undertook some important trials of wind pumping engines. The performance of the engines and pumps as combined machines was judged, it therefore does not necessarily follow that each engine had a pump most suitably proportioned to it; this, coupled with the fact that the governing in each case was not identical, somewhat affects the question of power efficiency. For the purpose of comparison with the four-armed mill, the leading particulars of the engine that gave the best results is herewith appended.

The wheel was 16 ft. in diameter, and had 18 vanes, each 4 ft. 10⅜ in. long by 1 ft. 11¼ in. wide at the outer end, and 11¼ in. wide at the inner. The total sail area was 131·32 sq. ft., the clearance space between the vanes being 67·93 sq. ft., and that of the central opening 30·88 sq. ft. The vanes were curved hollow to the wind to radii of 2 ft. 3½ in., and 1 ft. 6 in. at the outer and inner ends respectively, and were set to a weather angle of 35° at the tip, and 40° at the inner end.

With a 12-mile wind the horse-power of the water raised amounted to 0·571, which is equal to 2·39 ft.-lb. per sq. ft. of sail surface per second; the peripheral speed of the wheel being 1·05 that of the wind.

According to the formula derived from the Danish experiments, the work done by a four-armed mill constructed in accordance with the directions given, will amount, in a 12-mile wind, to 6·16 ft.-lb. per sq. ft. of sail surface per second.

For a mill 16 ft. in diameter, the maximum sail area would be 51·2 sq. ft., from which it will be seen that the horse-power works out to 0·573. This almost identical result is, however, fortuitous, as some allowance must be made to the disk mill for pump friction and slip; the latter, however, was slight, the efficiency of the pump being 97·6 per cent.

There remains to be considered the methods by which the disk mill is governed and automatically faced to the wind. With mills up to a diameter of 25 ft., when used for pumping, this is usually and very successfully accomplished by causing the wheel (which in this case has fixed vanes) to throw more or less out of the wind, receiving its force obliquely and so with diminished effect. Normally the wheel is kept to windward by the action of a large tail vane, but as its shaft is carried a little to one side of the turn-table or head, and the tail vane hinged to the latter, there is always a tendency for the head to turn at right-angles and bring the wheel into line with the tail vane, in which position it would present its edge to the wind. This is opposed by the pull of an adjustable spring or weight, but if the wind exceeds a certain pressure, this opposition is overcome with the result before mentioned. The system most frequently adopted in the larger mills, and probably more generally suitable where the power is transmitted by bevel gearing—which would be the case with dynamo driving—consists in employing adjustable hinged vanes. In this case the vanes, instead of being rigidly fixed, are socketted to the framing of the wheel at their outer and inner ends respectively; weights, acting through levers and rods, hold the vanes to their normal weather angle during ordinary conditions, but if the wind pressure becomes excessive the vanes give to it and present less effective surface. One great advantage of this system is that the weathering of the vanes can be altered while the mill is running, and the speed of the machinery regulated to requirements.

The steerage of this type of mill, in common with the old four-armed "tower" mill, is nearly always effected by a "back sail" or "fantail," the axle of which lies at right angles to the wind shaft. So long as the edge of this fantail is presented to the wind no motion ensues; but should the wind shift, so as to strike it sideways or obliquely, it will revolve. This motion is communicated by a train of gearing to a circular rack attached to the top of the tower, by means of which the movable head carrying the main sails is turned, bringing them to face the wind. It is very important that the fantail should be amply powerful and "lively," in order that it may quickly respond to changes in the wind, especially is this so in cases where the mill is left to its own devices. Instances have occurred where a breeze has sprung up right behind the mill, in which event the fan will not revolve, the result being that the mill becomes "tail winded"; this is a possible source of danger which should not be overlooked.

We now come to the question of the installation itself; this presents problems analogous to those of a train lighting system. The first point to consider is the transmission of the wind power to the dynamo. Although a carefully constructed four-armed mill with "patent" sweeps will give a sufficiently steady drive for corn milling, or similar operations, the incessantly varying force of the wind has rendered the adoption of a supplementary regulating device advisable. In a large mill at Askov, Denmark, where the experiments before referred to, were carried out, a piece of apparatus known as a "Kratostat" has been devised. Briefly, this consists of an endless belt hanging over two pulleys, one above the other, in such a way that two loops are formed on either side of the lower pulley; into each loop is placed a loaded jockey pulley. The upper pulley is the driver, and the lower the driven, and to the latter is attached direct, or connected by belting, a pair of plates or fliers, which in revolving offer resistance to the air. It follows that if the speed of the driving pulley is accelerated, the resistance of the revolving plates will increase and impose a greater tension on the driving side of the belt, with the result that the weighted jockey pulley, hanging in the loop on that side, will be raised. If, on the other hand, the speed diminishes, the jockey pulley on the "slack" side will rise, and that on what was formerly the tight or driving side, will sink. This rising or falling motion is communicated by a cord to a system of levers, which by altering the distance between the pulleys in the main drive, slackens or tightens the driving belt to the dynamo, as occasion requires, and causes the same to be run at a constant speed. Both dynamo and kratostat are driven from the same shaft.

For charging accumulators the same end has been accomplished, in a more simple manner, by employing an intermediate vertical drive from which a horizontal belt runs to the dynamo. The lower pulley, of the intermediate drive, is mounted in a frame which allows of slight vertical play, but without affecting the tension of the horizontal belt, and is so weighted as to permit the vertical belt, which is slightly greased, to partially slip when the full power required by the dynamo for maximum output is exceeded. The same principle has been adopted in Stone's system of train lighting, and enables a shunt-wound dynamo to be used.

In another installation in this country in which the motive power is a disk mill, constant velocity is not sought, but, instead, a special dynamo is employed which, it is stated, will charge the cells at any speed between 600 and 1,400 R.P.M. This machine is shunt wound, but has a certain number of series turns in opposition to the shunt; as, however, a very small difference in current will alter the E.M.F. considerably when the machine is running at the higher speed, with a weak field, an automatic regulator, cut in or out by the windmill, is employed.

This plan is, of course, less wasteful of wind energy than the former, but it introduces electrical problems of a more complicated nature.

It goes without saying that the automatic cut in and out accumulator switch must receive special attention, as owing to the incessantly fluctuating speed conditions, it will be very frequently called into action. As to the storage capacity of the battery, this can only be decided after a careful review of the local circumstances, but it is thought that the account of existing installations, with which this article concludes, will be of some guidance in this respect.

Short notices have appeared in various scientific publications with reference to the Askov installation, and for convenience they are here summarised.

The windmill, which was erected in 1897, has four ("patent") sweeps, the span of which is 75 ft. and the breadth 8½ ft., it is provided with automatic self-winding gear similar to that of an ordinary tower mill. Two dynamos are in use—one of 28 volts by 250 amperes for water electrolysis, and one of 150 volts by 40 amperes for charging a 60-cell battery with a capacity of 390 ampere-hours.

Some recent particulars of this installation appeared in the Electrical Review of April 20th last. There are now connected 450 incandescent lamps, besides a few arc lamps and motors. A petrol motor has also been added as an auxiliary. The figures relating to prime cost and working expense, which presumably refer to the plant just described, are here repeated :—

Wind motor	£165
Base of same	110
Petrol motor	165
Accumulator	275
Dynamo	50
Gear...	19
Switchboard and cell switch	19
Mains	70
Total	£873

The working cost per annum is given as follows :—

Attendance—oiling and starting windmill ...	£11 0 0
,, ,, petrol motor ...	6 15 0
30 days' petrol consumption	11 0 0
Lubricant	4 10 0
Total	£33 5 0

The receipts for energy amount to £140, giving an excess of receipts over expenditure of about 12 per cent. on the capital outlay.

The addition of an auxiliary petrol motor is rather a "damaging" item; the reason given for its adoption is that its cost is less than that of the extra storage that would otherwise be necessary. It must be remembered, however, that this installation is for public supply, and in consequence economy in the use of the light during exceptionally calm weather, which might be reasonably expected with a private plant, could not be looked for or desired in this case. The storage capacity of the battery in relation to the number of lamps is very low, but, notwithstanding this, the petrol motor is only in use for about 30 days in the year.

The next installation to be described is that at Boyle Hall, West Ardsley, Yorks, and the writer is indebted to the consulting engineers, Messrs. Shepherd & Watney, for information concerning it. In this case the sole source of power is one of Mr. J. W. Titt's "Simplex" self-regulating wind engines. The sail wheel, which is 30 ft. in diameter, with 50 hinged vanes each 10 ft. long, is mounted on a hexagonal steel tower 35 ft. high, and this is erected on a stone base 15 ft. in height, so that the centre of the wheel is 50 ft. above ground level. The power is transmitted to the base by bevel gear and thence to the dynamo by belting, the driving pulley being 8 ft. in diameter.

According to the makers' tables, the actual horse-power of the mill is 3, 4, 5½, 7 and 9 for wind velocities of 10, 12, 16, 20 and 25 miles per hour respectively. The dynamo is a two-pole machine, and has already been referred to; it is provided with carbon brushes and self-oiling bearings. Both mill and dynamo are left entirely to themselves, the latter being situated in a locked-up building, 200 yards from the house, and only looked at once or twice a day for a few minutes on each occasion. As a rule the mill is not run during lighting hours. The battery consists of 60 D.P. cells, with a capacity of 490 ampere-hours, which is considered sufficient for eight days' supply.

Altogether there are 109 lamps, 20 of which are of 8 C.P., the remainder being of 16 C.P. The plant was started in February, 1899, and has been running ever since, under the supervision of the gardener, who devotes about four hours a week to its attendance—most of this time being given to the cells. In May last, the sections of the storage cells were renewed for the first time; thus the original plates had a life of over seven years, which, having regard to the fact that the charging current often varies from nothing to the maximum over 100 times an hour, may be considered a very satisfactory result. The commutator of the dynamo is stated to be as good as when put in, which, as the brush rocker is not touched, proves complete absence of sparking, in spite of the extremely fluctuating current delivery. In a notice of this installation, published in the "Country Gentlemen's Estate Book for 1904," the total cost, including the base of the tower, and the dynamo and battery rooms, all of dressed stone, is stated to be £1,200. The actual running expenses, including maintenance, are given at £30 per annum, or with 4 per cent. added, as interest on capital, £78 per annum.

In conclusion, it may be urged that wind power is not only extremely economical, but has the additional advantages of being cleanly and picturesque.

SOME PRACTICAL NOTES ON THE COMMERCIAL DEVELOPMENT OF ELECTRICITY SUPPLY UNDERTAKINGS.

By R. BORLASE MATTHEWS, Wh. Ex., A.M.I.C.E.

Introductory.

It is now rapidly becoming an accepted fact that the incorporation of a "New-Business" department into the organisation of a Public Electricity Supply undertaking is an absolute necessity. Only a short time ago managers looked askance upon this idea, and though they considered it as possibly a good thing for the large cities, they thought it to be sheer waste of good money and valuable time in the case of the smaller towns, especially those of under 50,000 inhabitants. In time, however, comparisons of the kilowatt-hour consumption per capita in various cities indicated that where an aggressive new-business-getting policy was put into operation, the figures soon increased in a very acceptable manner, and likewise the profits, owing to the additional output and the increased load-factor, or, as it is sometimes expressed, the smoothing out of the load curve.

Some enterprising managers in a few of the smaller towns were then bold enough to try to adapt to their circumstances some of the schemes that were operating successfully in the larger cities, and found that they were well repaid for their efforts. Others, in turn, noting their achievements, have followed their example, until there is now beginning to spread a wave of enthusiasm for an energetic new-business-getting campaign. Its evidences are found in the mail of every central station, for at frequent intervals the literature of advertising companies comes to hand, urging the adoption of their newspaper or mail systems of advertising; the manufacturers offer the loan of electrotypes for illustrating newspaper or other local advertising; they also announce that they are prepared to supply literature descriptive of their particular wares, with the name of the central station printed thereon, for local distribution—an arrangement which is obviously of advantage to both parties. They furthermore put forward attractive offers and suggestions for the introduction of their apparatus to consumers on the sale or return basis, or facilitate sales by the adoption of a hire-purchase or easy-payment system. Articles are appearing at frequent intervals in the Technical Press, and special publications are being issued, all bearing on this subject.

In the United States the Association of Licensed Manufacturers of Incandescent Lamps is spending a very large sum of money to stimulate this kind of work. The National Electric Light Association has appointed a Committee to investigate and advise concerning the same matter. An Association which has been formed, and is already doing excellent work, is known by the following somewhat unwieldy but suggestive title:—"The Co-operative Electrical Development Association." This Association in its main scheme has for its object the general education of the public and the arousing of electric supply undertakers to the fact that it is to their own interest to investigate methods and to inaugurate an active new-business-getting campaign. The funds for its operations are provided by the co-operation of the various electrical manufacturing concerns, who set apart a certain percentage of their income for this purpose, as they realise that it is to their individual advantage if the sales of electrical apparatus in general are greatly increased. All these steps are being taken in response to the demand which has arisen for assistance in this new departure.

In England, so far, no similar systematic, collective or co-operative efforts have as yet been inaugurated, though much interest has been aroused by the papers which have been read before the Institution of Electrical Engineers and the Municipal Electrical Association. Great strides, however, have been made in certain individual cases, each of which, as it were, has worked out its own methods and schemes with what meagre assistance could be obtained from the few sources available. Now, though it may be broadly stated that such methods are merely based on sound common-sense business principles, there are many practical details, the knowledge of which would make all the difference in the time required to attain the desired end as quickly as possible. With a view of giving as much assistance in this direction as possible, a series of articles, of which this is the first, has been specially prepared at the request of the editors of the Electrical Review.

This movement in the direction of the development of the commercial side of the electric supply business is no ephemeral change, but rather the evolution which is taking place consequent on the settling down, or rather standardisation, of the methods of generating and distributing electricity, together with the improved appliances suitable for the consumer's use which are at present available, and the confidence that has now been established in the mind of the general public in regard to the reliability and economy of electric lighting and power.

The advertising columns of the Electrical Review, with their oft-repeated demand for a "commercial assistant," indicate the general conviction, which is rapidly gaining ground, that a New-Business department is of increasing importance, though, in passing, it may be remarked that from the salaries offered at present, the advertisers do not as yet appreciate that such a position is one which can only be filled by a highly-qualified and capable man, whose services cannot be obtained at a low figure, as such men are scarce. It will have been gathered from the opinions expressed in the editorial columns of the Electrical Review from time to time, that it is the conviction of the editors that the manager of the commercial department will eventually become the most valuable member of the staff of an electric supply undertaking.

It is difficult to give figures by which the results obtained in various towns may be compared. A method, though of course only an approximate one, which gives a very satisfactory basis of comparison, is to ascertain in the towns to be compared the number of equivalent 8-c.p. lamps connected per capita, the number of units consumed per cap. per annum, and the total income per cap. per annum. It may be argued that certain towns have a greater working population than others, but in such cases the connected load in motors is usually greater, which assists in equalising the various factors. Taking the average of English towns having populations varying from 70,000 to 175,000, it will be found that the average number of equivalent 8-c.p. lamps connected per cap. is 1·18; the average number of units consumed per cap. per annum is 23·25, and the average total income per cap. per annum is 4s. 10½d. If these figures are compared with those of towns where an active new-business-getting campaign is being carried on, it will at once be observed that in these particular towns the figures are all very much greater, pointing at once to the beneficial effects of such a campaign. The number of units used per cap. per annum divided by the equivalent 8 c.p. lamp connections per cap., of course indicates the state of the load factor; the larger this number is, the better the load factor, and the greater the probability of a lower cost of production, as the fixed charges will be less. For the present argument it will, therefore, be sufficient to consider the comparative total income.

With a properly conducted campaign there is no reason why the total income should not reach 15s. per cap. per annum. In a number of American cities the figure of 20s. per cap. per annum has been reached, and one case has come to the notice of the writer where the 32s. mark has been attained. It may be suggested that the Americans are more progressive than ourselves, and also that there is not much gas competition. It, however, does not take a very long sojourn in places other than the larger cities, such as Chicago and New York, before the fact is appreciated that there are many Americans who are far from progressive, and that gas competition is a very serious factor in the older cities. In many parts of the States there is also the competition of cheap natural gas. In fact, it is only recently that the American central stations have commenced to realise that it was necessary to hustle for business.

Compared with other methods of artificial illumination and sources of motive power, electricity plays but a small part in its bid for the business of English towns at present. There is no reason why this should be so, other than the lack of knowledge on the part of the general public of the possibilities and advantages of electricity, except, perhaps, in certain cases where prices are high, but if the output can be

increased, these prices can be reduced as the fixed charges will then bear a smaller and smaller proportion to the total cost of production. The costs of distribution will also be reduced as the customers increase in a given area, as the mains will then serve a greater number in that area. The possibilities of the extension of an electric supply can partially be realised by a consideration of the present large incomes of gas companies and the great number of customers they have. Of course, gas will never be entirely ousted from the field it has held so long; it is against natural laws that it should be, for no one thing can ever be a panacea for all ills, but the obvious advantages of electricity cannot but largely remove any handicap in its competition with an established system. It does not need a great enthusiast now, to prophesy that the time will undoubtedly soon be here when about 75 per cent. of the buildings in every town will be wired for some application or other of electric light and power.

The need admitted, the question arises as to how new business, and that which is also included in the same term, an increase of existing business, may best be secured. It is a difficult problem, for in the smaller towns the staff is generally reduced to the point of absolute necessity, owing to the feeling that expenses should be cut down as much as possible, for the profits of a central station business, at their best, are not great. The already over-worked staff is at the present time putting forth its best energies in this direction, as far as permitted by the time and attention required for the operation of the generating plant in that manner so essential for the ensurance of a satisfactory supply of current to existing customers. The solution seems, therefore, to be rather in the way of a better direction of these efforts by adopting more systematic methods based on the results of experience obtained in other cities and towns, so that the best use may be made of the time available.

It is certain that whatever is done in the way of new-business-getting must be done in a systematic manner. The lines that should be followed are those which successful manufacturers of various goods have taken. There is a very close comparison between the art of selling various manufactured articles and selling electricity. The central station has the advantage in that its prospective customers are near at hand, so that many soliciting expenses, or rather wastes—such as loss of time and money in travelling—are eliminated. The field is concentrated; and, in addition to personal canvassing, it may be easily and economically kept alive and interested by judicious advertising in the local Press, by "direct-by-mail" advertising and by the even more valuable self-recommendation brought about by the high quality and the superiority of the light given over that obtained from other artificial illuminants, as exhibited by the display in the show windows of the leading shopkeepers on the main streets. People talk, and if only they can be induced to talk electric light and power, the campaign for new business is half won; hence the importance of giving a satisfactory service, and of keeping the possibilities and advantages of electricity well before the general public.

GAS.

We are now fast approaching the season when the time-honoured observation that "The evenings are drawing in" will again be in fashion. In anticipation of this interesting piece of news, our friends of the gas interest are illuminating the columns of the popular Press with the usual *jeux d'esprit*, calling attention to the immeasurable superiority of their methods of counteracting the above disadvantage over all others. From one of the longer and more painstaking of these articles we extract the following gems, anxious that so much talent should not fail to receive the consideration it merits from the superior intelligences reached by this paper.

The dissertation before us appears to be the second of a series; it commences, however, by a short introduction briefly alluding to the drawbacks of darkness, which condition, says the learned writer, was "one of the vehicles chosen to scourge Egypt." Although this is somewhat suggestive of a Kensington description of the motor-'bus, it is, of course, merely the essence of a succession of b metaphors, just as one might say that the incandescent ga mantle is "a rag-time throb in the music of the spheres" (in writing, but in conversation not without danger). However, *aliquando bonus dormitat Homerus*, and worse similes may be found in the works of other humorists.

The remedy for the disagreeable conditions of darkness, the article very justly proceeds, is to be had by the intervention of one of two agents . . . . gas and electricity. Of these, we are told, gas is the senior, a distinction which it shares with the rushlight. "It is a matter of common knowledge," we find, "that gas is cheaper than the electric light." It certainly is a widespread impression, though in some districts it might be more accurately styled a "matter of common i· ·ce." It is one of those convictions which the evide· ·arterly accounts alone will dispel.

Here, however, we come to the particular piece of information which is worth the whole sum paid for the copy of the journal in which it is published, thus:—

"Friends of the electrician are ever ready to enlarge upon the deleterious effect which a gas jet exercises on the air of a room." (There are many who have heard opponents of electric light make the same complaint.) "It burns up the oxygen, they say, and, as proof of its impurity, they point to the discoloration of ceilings which it occasions."

"All these arguments are fallacious. True, the gas consumes oxygen in the rooms in which it burns. *In doing so it causes ventilation, and the free inlet of a further supply of pure air (!)*" Here is muscular and robust partisanship! The complicated problems of ventilation solved in one simple act! Descend with the informant into a subterranean—tea-shop, say, and he will doubtless point out, while admitting that the atmosphere in places (notably on the stairs) consists of a solid bank of warm CO_2, that if the place were lighted by electricity, life in it would be absolutely impossible. This is faith; and faith is required to absorb it—both atmosphere and doctrine.

"As to the discoloration which gas causes on the ceilings, this is actually a sign of the beneficial influence which it exercises on the air, and not, as is popularly supposed, a sign of its impurities. . . . The burner is in effect constantly sterilising the air. The organisms which it holds in suspension are drawn to the flame and heated. Instantly these fly upwards and stick to the ceiling."

A most ingenious and well-argued thesis. Were it not (alas!) for the fact that the Bunsen, which passes the most air through the flame, bestows no "fried-microbe" effect on the ceiling, we ourselves were in imminent danger of conversion.

The writer goes on to advocate a lower standard of gas purity, rendered possible by the use of the incandescent mantle. This is beyond the scope of a humorous article, and introduces a sulphurous streak, as anyone who has suffered from the products of a small country gas-producing plant can testify. No amount of blackened ceiling area will compensate for the weird and penetrating smells which result, and surely an evil smell is nature's warning to "keep clear."

This ends the first part of a really clever defence, and we have afterwards a more practical flavour in the description of new forms of mantles and burners. As the title of the article is "The Case for Gas," it is possible that electricity may also have a turn. If it is treated with the same hearty determination to "look on the bright side," we have in prospect a panegyric of such vigour as to render an already glowing page a useful substitute for a gas stove. Such optimism as this would give a "lime-light effect" with the sole assistance of a stray glow-worm.

Austrian Cable Manufacture.—The Wien Bank Verein announces the transfer of the Vienna cable factory of the Kabelfabrik Actien Gesellschaft, of Pressburg, to the Moravian-Silesian Wire Industry Co., which assumes the title of the Kabelfabrik und Draht Industrie Gesellschaft. The purchase price is to be paid by increasing the share capital of the absorbing company from 2,800,000 kr. to 5,000,000 kr. It is now proposed as a result of this transaction to establish a community of interests between the two companies by dividing the market and the annual profits.

NEW PATENTS APPLIED FOR.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

7,962B. "Accelerator for cars in tubes or tunnels." B. F. Carpenter. (Date applied for under Rule 5 of the Patents Rules, 1905, April 3rd, 1906.) October 1st. (Complete.)

7,962C. "Arrester for cars on automatic railways." B. F. Carpenter. (Date applied for under Rule 5 of the Patents Rule, 1905, April 3rd, 1906.) October 1st. (Complete.)

21,597. "Electrical leakage detector and alarm." L. H. Marlor and W. West. October 1st.

21,604. "Improvements in fittings for electrical conduits." J. W. Brooks and A. E. Read, trading as the Walsall Hardware Manufacturing Co. October 1st.

21,623. "Improvements in receiving devices for electric transmission." I. Kitsee. October 1st. (Complete.)

21,627. "Improved permanent magnet." F. Clarke. October 1st.

21,638 "Device for regulating electrically-heated incubators." J. Kiell and A. A. Stow. October 1st.

21,654. "Improvements in the manufacture of filaments for incandescence electric lamps." J. Y. Johnson. (Dr. Hollefreund & Co., Germany.) October 1st.

21,668. "Improvements in terminals and the like for electric conductors especially applicable for use in incandescent lamps." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) October 1st.

21,669. "Improvements in and in the manufacture of electric incandescent lamps having metal filaments." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) October 1st.

21,670. "Improvements in and relating to dynamo-electric machines of the unipolar type." J. E. Noeggerath. (Date applied for under Patents Act, 1901, October 4th, 1905, being date of application in United States.) October 1st. (Complete.)

21,675. "Improvements in incandescent electric lamps." H. C. Hubbell. October 1st. (Complete.)

21,682. "New or improved ear-protecting cap for telephone receivers." M. Berger. October 1st. (Complete.)

21,691. "Improvements in and relating to connections for use with electric conducting wires." G. Ashwell. October 1st.

21,697. "Improvements in electric sparking plugs for use with internal combustion engines." A. J. Howard and W. Allen. October 2nd.

21,703. "Automatically governed motor-car accumulator charging dynamo." F. A. Fitch. October 2nd.

21,714. "Device for indicating the state of the switches and cables on any electrical distribution system." J. R. Beard. October 2nd.

21,719. "Improvements in or relating to electric accumulators." H. W. van Raden, C. B. Robinson and M. Metz. October 2nd.

21,747. "Improvements in joints of fittings for supporting electric lamps and the like." H. Bisseker. October 2nd.

21,765. "Improvements in telephone apparatus for the use of submarine divers and others." J. Holman. October 2nd.

21,767. "Improvements in apparatus for producing oscillatory electric currents." P. C. Hewitt. (Date applied for under Patents Act, 1901, October 9th, 1905, being date of application in United States.) October 2nd. (Complete.)

21,769. "Improvements in or relating to graphite carbon electrodes for electrical bleaching apparatus." P. Schoop. October 2nd.

21,783. "Improvements in dynamo-electric machines." G. W. Somerville. October 3rd.

21,793. "Improved method or means of connecting the armature wires or conductors to the commutator segments of dynamos and motors." C. W. Dawson. October 3rd.

21,872. "Improvements relating to telephonic store service and credit-checking apparatus." The National Cash Register Co., Ltd. (National Cash Register Co., United States.) October 3rd. (Complete.)

21,873. "Improvements in alternating-current dynamo-electric machines." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) October 3rd.

21,874. "Improvements in and relating to electric arc lamps." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) October 3rd.

21,925. "Improved automatic starting switch for electric motors." A. H. Johnson and W. J. Thorrowgood. October 4th.

21,945. "Improvements in short-circuiting overhead electric conductors or cables." E. Giraud. (Date applied for under Patents Act, 1901, October 6th, 1905, being date of application in France.) October 4th. (Complete.)

21,952. "Improvements in power plants for the production of alternating electric current by steam engines." F. W. Howorth. (Maschinenfabrik Oerlikon, Switzerland.) October 4th. (Complete.)

21,963. "Improvements in joints for tubular metallic telegraph and like poles or standards." F. C. Guy. October 4th.

21,966. "Improvements in hydraulic lifts electrically operated." E. M. T. Boddam. October 5th.

21,967. "Improvements in contact breakers for motor road vehicles." C. Lake and G. Lake. October 5th.

21,971. "Improvements in sheaves and pulleys especially applicable to trolley sheaves used on electric cars." S. Williams. October 5th.

22,000. "Improvements in storage batteries." E. Sokal, S. Bloomfield, S. B. Wolf and C. Wolff. October 5th.

22,002. "Improvement in the deposition of metallic alloys by electrolysis." R. B. Wheatley and F. B. Lark. October 5th.

22,031. "Electrolytic manufacture of peroxide of hydrogen." A. J. Boult. (O. Urbasch, Italy.) October 5th. (Complete.)

22,035. "Improvements in or relating to electric transporting devices operating with solenoids." J. V. Wengelin. October 5th. (Complete.)

22,031. "Improvements in the bases of electrical fittings." H. Hirst and C. E. Gunner. October 6th.

22,101. "Improvements in trolley wheels for electric tramways or railways." F. E. Kenney. October 6th. (Complete.)

22,107. "Improvements in space telegraphy." S. Cabot. Date applied for under Patents Act, 1901, November 18th, 1905, being date of application in United States.) October 6th. (Complete.)

22,113. "Lock-out for party line telephones." The Select Telephone Manufacturing Co. and W. M. Bruce, Jun. October 6th. (Complete.)

22,119. "Improvements in or connected with electric cells." H. Leitner. October 6th.

22,132. "Improvements in electrical cells." E. Gersabeck. October 6th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool, price, post free, 9d. (in stamps).

1905.

Devices for Perforating Paper Strips and the like, Specially Applicable for Use in Connection with Automatic Telegraphic Apparatus. Pollak. 11,903. June 7th.

Cross-Over Points for the Overhead Electric Conductors of Trolley Traction Systems. A. H. Holmes and H. W. Holmes. 18,118. September 7th.

Electric Train Control System. A. Sundh. 18,126. September 7th.

Telephonic Apparatus. Still and Adamson. 18,924. September 19th.

Manufacture of Incandescing Bodies for Electric Incandescent Lamps. A. Just, F. Hanaman, H. Landesberger, I. Salzmann and Vereinigte Elec tricitäts Akt.-Ges. 20,175. October 5th.

Manufacture of Incandescing Bodies for Electric Incandescent Lamps. A. Just, F. Hanaman, H. Landesberger, I. Salzmann and Vereinigte Elec-tricitäts Akt.-Ges. 20,175A. October 5th. (Date applied for under Rule 5, Patents Rules 1905, October 5th, 1905.)

Buzzers or Sounders for Telephone Stations. H. Oppenheimer. (Akt.-Ges. Mix & Genest, Germany.) 20,231. October 6th.

Alternating Current Electric Motors. British Thomson-Houston Co., H. S. Meyer and P. A. Mossay. 21,064. October 17th.

Alternating Current Dynamo-Electric Machines. British Thomson-Houston Co., Ltd. (General Electric Co.) 22,262. October 31st.

Mono-Phase Electric Motors. Elektricitäts Akt.-Ges. vorm. W. Lahmeyer and Co. 23,904. November 20th. (Date applied for under International Convention, November 21st, 1904.)

Electric Interlocking of Railway Signals with Block Telegraph Instruments. W. R. Sykes, jun., F. T. Hollins and F. W. Leake. 24,280. November 24th.

Electrical Block Indicators for Railway Gate Crossings. W. R. Sykes, jun., F. T. Hollins and F. W. Leake. 24,281. November 24th.

Wireless Telegraphy. F. Lori. 24,718. November 29th. (Date applied for under International Convention, November 30th, 1904.)

Sand Gear for Electric Tramcars and the like. H. L. Kenworthy. 25,084. December 4th.

Trolley Standards for Electric Cars. L. Aldworth, L. W. Crosta and W. Boot. 25,811. December 12th.

Electrically Lighted Miners' Safety and like Lamps. A. Jones and T. A. Jones. 25,971. December 13th.

1906.

Devices for Detecting Faults in the Insulation of Electric Conductors. A. J. Boult. (S. W. Wardwell, United States.) 6,099. March 13th.

Transmitters for Electro-Magnetic Waves. J. Sahulka. 6,219. March 14th.

Mounting Electrical Measuring Instruments. E. F. Moy, P. H. Bastie and Ernest F. Moy, Ltd. 9,330. April 20th.

Single-Phase Alternating Current Electric Traction Systems. Siemens-Schuckertwerke Ges. 9,846. April 27th. (Date applied for under International Convention, June 16th, 1905.)

Electric Trumpets and the like. E. Settegast. 10,674. May 7th.

Supporting Devices for Telephone Apparatus. H. Sefton-Jones. (H. Boas, Germany.) 10,702. May 7th.

Indicating and Recording Apparatus for Electric Pyrometers and the like. W. Armour. 1,906. January 25th.

Electrolytic Apparatus. F. McDonald. 4,716. February 26th.

Apparatus for Compounding Alternating Current Dynamo-Electric Machines. Bruce Peebles & Co. and J. L. La Cour. 4,871. February 28th.

Safety Connectors for Electric Conductors. G. M. Corell. 5,865. March 12th.

Vapour-Electric Apparatus. P. C. Hewitt. 9,253. April 19th. (Date applied for under International Convention, April 28th, 1905.)

Electrical Cables. British Insulated & Helsby Cables, Ltd., and G. H. Nisbett. 11,149. May 12th.

Tools to be Used in Removing the Metal Sheathing from the Ends of Metal Sheathed Electrical Conductors where Connections are to be made. E. L. Berry and F. Harrison. 13,326. June 19th.

Electric Metering Apparatus. Allgemeine Electricitäts Ges. 17,431. August 2nd. (Date applied for under International Convention, August 2nd, 1905.)

S. O. B.—The second annual re-union of the S. O. B., consisting of men trained at Acton Hill Works in the eighties, was held at the Manchester Hotel on the 6th inst., Mr. C. Newton Russell, M.I.E.E., in the chair. The meeting was unique in its way, consisting as it did of old friends who had mostly lost trace of each other for many years. Letters and telegrams were read from members in all parts of the world, who were unable to attend. It was remarked what a very large proportion of the members were holding important positions as chiefs of tramway or lighting stations, works managers, or heads of firms. The goodwill and enthusiasm of those present were marked. No speeches were allowed, but after the dinner an excellent amateur concert was given. The following are the names of the Old Boys present:—Messrs. C. Newton Russell, E. L. Pinching, Robt. J. Elmhurst, C. E. Tickner, E. Davidson, C. F. Jackson, F. Armfield, C. D. Aspray, C. E. W. Talbot, Louis A. Jinks, B. E. Arkell, J. R. Smith, H. Sadd, J. Watts, Hastings Squire, Wilfred C. Thomson, W. M. Rogerson, E. Eberwein, W. E. Toy, C. Franklin Tubbs, H. A. Place, and H. Marryat. We understand that there are still about 50 addresses of Old Boys wanted; those interested should address the hon sec., Mr. H. Marryat, 28, Hatton Garden, E.C.

Engineering Standards Committee.—At the request of the above Committee, the National Electrical Manufacturers' Association (Incorporated), has appointed Mr. G. K. B. Elphinstone, of Messrs. Elliott Bros., Century Works, Lewisham, to be its representative on the Sub-Committee on B.A. Screws.